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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

Briefly Told 905

The Lighting Tables of the American Meter Company—Obituary, Mr. George J. McGourkey—Death of Mr. George N. Ewing—Notes.

*Experimental Determination of the Heat Generated per Candle Power by Oil and Gas Lamps, by Prof. S. D. Jacobus—Concluded from page 876 906

The Use of Asphaltum for Reservoir Linings, by Mr. Jas. D. Schuyler, C.E 909

*Ruud's Automatic Steam Regulator for Gas Producers 912

*The Gasholder Tanks of the Bay State Gas Company 913

Something about the Electric Service at the World's Fair 914

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 915

Mr. Villard Retires from the St. Paul (Minn.) Gas Light Company—Fred. Bredel as a Nimrod—Gas Company for Pana, Ills.—Suits for Damages against the Boston Gas Company—The Ellsworth Process Gas Costs Something Instead of Nothing—Hints from Bridgeport, Conn.—Boston Company's Agreement with the Consumers Ratified—Mr. Tracy Fires the Itinerant Inspector—Gas Works for Mexico, Mo.—Interviewing the Authorities of Springfield, Mass., in Regard to Municipal Control of the Lighting Plants—The Inspector Gets to Peekskill, N. Y.—The Boston *Transcript* Goes Wrong—Annual Meeting, Columbia, Pa.—Mr. Addicks and the Street Department of Wilmington, Del.—A City Father of Chattanooga Thinks Well of Himself—Proposed Opposition for Des Moines, Iowa—And Other Items.

Silencing Gas and Steam Engine Exhausts 917

The Market for Gas Securities 918

BRIEFLY TOLD.

THE LIGHTING TABLES OF THE AMERICAN METER COMPANY.—The American Meter Company will not publish this year the customary edition of the pocket diary known as the "Gas Engineers' and Superintendents' Almanac," but in order that its tables for public lighting may be still available, the Company has decided to print the same in its standing page advertisement in the JOURNAL. The arrangement is that with the last issue for each month shall appear the regular daily lighting tables for the following month, which will be repeated in each succeeding issue until the date necessary to print the tables for the next month. Every issue will contain the statement of the total number of hours of lighting for each month, as well as the total for the year, under the moon table schedule and according to the New York City schedule of every night and all night lighting. The table for January, 1893, appears for the first time in this issue of the JOURNAL. It will be found on page 923.

OBITUARY—MR. GEORGE J. MCGOURKEY.—An estimable gentleman laid down the cares of life when Mr. George J. McGourkey answered the summons of death. He had been a patient sufferer for many months, and long knew that the end was drawing near, but with the spirit of a true Christian he waited calmly for that which must come to us all. He died on Wednesday, the 14th inst., at his home in this city, surrounded by his wife and family, who now, amidst this festive season, mourn for a tried husband, a careful father and a trusted counsellor.

George J. McGourkey, who was the son of William G. McGourkey and Maria E. Wheldon, was born in Albany, N. Y., in 1833, and on the paternal line traced back to the revolutionary period, his grandfather having fought with the heroes of that time on the side of those who battled for the principles of liberty. It is notable, too, that his great grandfather was born in Albany city. His father, whose death occurred something over a year ago, was very prominent in the development of the canal system of the State, in respect to the growth and management of which he was considered an authority; and his kindly face and even temper were, up to the time of his death, a very part and parcel of the Canal Department at Albany. No matter what political changes came about in the State, Wm. G. McGourkey retained his post. The subject of this sketch received his education at the Albany (N. Y.) Academy, and on coming out from there he determined to seek New York City as the field of his future business life. He was first employed by Mr. E. B. Wesley, a broker in stocks, and subsequently entered the money brokerage office of S. Van Duzer, remaining with the latter until he (Van Duzer) organized the Exchange Bank, of New York. A good opening shortly presented itself, in the shape of an appointment as assistant note teller in the Metropolitan Bank, which position he assumed in 1853. Bright, pertinacious, accurate and methodical, the young teller's course naturally attracted the attention of his superiors; and as the natural changes in business developed, he followed on and up. Passing through the various stages, he finally attained the position of cashier, a place that he filled with great credit to himself and to the advantage of the shareholders. The troublous times of '83 and '84 found George I. Seney, the active man of the bank, in tumultuous financial seas, and in the latter year the institution closed its doors. Many a time the writer has heard

it said that had Mr. Seney paid closer heed to the advice of his cashier, the ending of the Metropolitan Bank would not have been on record. However, Mr. McGourkey remained a cashier in the long liquidating process that followed, serving as such until '88, when he resigned. He retained his Directorship (to which position he had been named some years previously) in the bank at the time of his death. Naturally, his close relations with many of the prominent financiers of his time, caused him to be come interested in many enterprises, that, under his cautious and well-balanced guidance, soon put him in more than comfortable circumstances. In April, 1877, Mr. McGourkey was elected to the Board of Trustees of the American Meter Company, assumed the Vice Presidency, in April, 1884, and was elected President of the Company in 1887. The last-named post was resigned by him at the annual meeting this year, but he consented to a re-election as Trustee. His good business methods well ser ved this Company, and to its affairs his time and attention were freely given. In 1862 he was united in marriage to Miss Charlotte Jane Down, a daughter of the late Mr. Samuel Down, whose fealty to the gas business was only equaled by that of his close business associate, Mr. Thomas C. Hopper. His wife and three children (Samuel D., Carrie W., and Fred W., all residents of this city) survive him. The funeral services were celebrated by the Reverend Doctor Marvin R. Vincent, at the Madison Avenue Presbyterian Church, on the afternoon of Saturday, December 17th, and interment was subsequently made in the Down family burial plot, at the Sleepy Hollow Cemetery, Tarrytown, N. Y. Deceased was a good and true friend, and a thorough gentleman, whose habits and practice were those that long keep green our memory of our dead.

DEATH OF MR. GEORGE N. EWING.—On the 18th inst., Mr. George N. Ewing, Superintendent of the East St. Louis (Ills.) Gas Light Company, died at his home in that city. The funeral services were celebrated on the afternoon of December 20, and the remains were interred in St. Peter's Cemetery. Deceased, who was in his 69th year, had a somewhat uneven life. On leaving school he mastered the trade of a bricklayer, and later turned his attention to building operations on his own account. Amongst the buildings undertaken by him were three or four gas works that he subsequently sold. With the capital thus obtained he equipped a plant for making brick, the same to be manufactured under a so-called new "dry process." This venture turned out most disastrously and completely bankrupted him. Afterwards he was appointed Superintendent of the East St. Louis works, by Mr. W. D. Griswold, the owner, who had been a partner with him in the brick-making enterprise—a most convincing proof that deceased had the confidence of those who were nearest him.

NOTES.—Mr. Harry Maguire, formerly Superintendent of the works at Bellville, Ills., succeeds the late Mr. Ewing at East St. Louis.——Captain Jno. P. Keiser, formerly President of the Laclede Gas Light Company, of St. Louis, has purchased the Rich Hill (Mo.) Gas and Electric Light Company's plants, and has selected Mr. John Skahill to superintend the same. Mr. Skahill was formerly in the employ of the Laclede Company.——Last week the Committee on Gas, Oil and Electric Lights, of the Chicago Council, decided to recommend that the Council file the proposed ordinance to grant the Mutual Fuel Gas Company, of Hyde Park, the right to extend its main system over the entire city. If this course is adopted it means virtually the defeat of the project.——The Fort Wayne Electric Company has secured the contract to put in the new electric lighting plant at Anderson, Ind.——The Massachusetts Gas Improving Company has been chartered at Portland, Me. It is capitalized in $1,000,000, and its officers are: President, A. Berenberg; Treasurer, W. Johnson, both of Somerville, Mass.——Mr. C. B. Wright has been bid $1,500,000, by the city of Tacoma, Wash., for the water and electric light plants of that place. He is disposed to sell, but stipulates that the city must purchase the gas plant, also run by him, at an appraised price.——The Commissioners for the District of Columbia have, on the recommendation of Inspector Lusk, decided to replace with gas lamps many of the public lamps of the oil variety, which have hitherto made the lighting of certain sections of the city partake of the farcical.——The United States Gas and Fuel Company has been incorporated. The proposed field of its operations is Chicago, and the Company will endeavor to exploit the patented process of gas making recently brought out by Mr. J. W. Keneval. It is capitalized in $2,800,000, and the incorporators are Messrs. Calvin C. March, J. W. Keneval, E. A. Miller and J. B. Light.——The Washington (Iowa) Illuminating Company has added a new holder and purifying boxes to its plant. Manager Everson it seems has about made up his mind that there is more money in the gas works end than in the electric division of the Illuminating Company.

[Concluded from page 876.]

Experimental Determination of the Heat Generated per Candle Power by Oil and Gas Lamps.

By Prof. D. S. JACOBUS, Hoboken, N. J., Mem. Am. Soc. Mechanical Engineers.

Details of Experiments.

The average and total results obtained in the heat measurements with the lamps burning in the testing box are given in Table VIII. Table IX. gives the tests with the steam radiator in the testing box. All the lamp tests were necessarily made during the night, as there was no means of darkening the room in which the apparatus was placed.

In order to insure average railroad conditions in the trimming of the lamps, an expert lamp man was employed during several evenings to regulate the flames.

It was found that there was a great difference between the candle power of the lamps as ordinarily run in car service, and the maximum candle power that could be developed for a short time. If the wick is turned up high enough the candle power of a single wick at 45° may reach 30°, but it will quickly fall to a lower figure.

The height of flame to produce 16 candle power is 1⅛ inches above the wick. This is an average of a great number of settings made by the expert lamp man, who trimmed the wicks between every few settings, three nights being devoted to this portion of the work. In order to further verify the fact that 16 candle power is an average for good car practice, the heights of flames in lamps in railroad service was observed, and it was found to be less than 1⅛ inches. By special adjustment of the wick, however, the flame may be made to burn at a higher candle power than 16. In the test which was the most favorable the candle power at the start was 26, and after running six hours it was 22. At the beginning of this test the lamp did not smoke, but after running one hour it commenced to smoke slightly, and continued to do so for three hours. The flame in this case was worked over for two hours before the beginning of the test, the wick being pressed down at the points which produced smoking. The wick was turned up ¼ of an inch, which was also the height for 16 candle power, as trimmed and adjusted by the expert lamp man. If the wick is turned higher than ¼ of an inch the candle power will rapidly fall off on account of the wick becoming coated over with a hard crust. If turned up high enough to obtain the maximum flame, the candle power at 45° will fall from 30 to 18 in about ten minutes.

The flat flame lamps were also set by the expert car man, and the height of flame thus obtained, which was 1⅛ inches above the wick guard, compared with that in car practice. In this case, as in the argand lamp, the flame was found to be slightly larger than that employed in average car service.

The duration of the tests given in Tables VIII. and IX. is that over which the data is averaged. In all of the tests the apparatus was run some time before the data used in obtaining the average results was recorded. This was necessary in order to allow the testing box to become thoroughly hot. It was also difficult in some cases to obtain the desired set of conditions in regard to the velocity of air passing through the box, etc. In many cases the record was not taken until the apparatus had been in operation four hours. The average time required in starting the tests was about two and a half hours.

The readings of thermometers placed near the lamps and subjected to radiation are given in columns 15, 16, 17 of Table VIII. These were placed so that their bulbs protruded one half way through the car ceiling, and through the sides of the testing box.

In order to allow for differences in the velocities of air passing through the testing box in the lamp and radiator tests the following method was employed.

The anemometers were standardized by placing them on the end of a revolving arm and noting their readings. This arm was made of such a length that the distance traveled over per revolution was 15 feet. Calibrations were made throughout the entire range of velocities that the anemometers ran at during the heat tests. The results of the calibrations are indicated in Fig. 5.

The anemometers when used in the heat tests were moved about in the center portions of the pipes conducting the air.

In Fig. 6 the curves are given which show the number of cubic feet of air that would pass through the pipes per second provided the average velocity was that indicated by the anemometer after the proper corrections, as determined by the curves given in Fig. 5, are applied.

The crosses and dots with circles around them in Fig. 6 represent the radiator calibrations of the anemometers. These calibrations give the

TABLE VIII.—*Average and Total Results Observed in Heat Measurements.*

Number of Test.	Class of Lamp.	Date of Making Test.	Duration of Test, in Hours.	Velocity of Air over Car Roof, in Miles per Hour.	Number of Flames Burning.	Total Candle Power.	Cubic Feet of Gas Burned per Hour, or Pounds of Oil per Hour.	Barometer Reading, in Inches of Mercury.	Temperature of Air, in Degrees F.					Reading of Thermometer Placed Near Lamp and Subjected to Radiant Heat, by Degrees F.			Time Required for Anemometer to Register 100 Feet, in Seconds.		Volume of Air Passing through Pipes per Cu. Ft per Sec., Determin'd by Tests given in Table V.	
									Entering 12-Inch Pipe.		Leaving 10-In. Pipe.	Leaving Ventilator.	External Air near Testing Box.	Roof 8½ Inches from the Center Line of Lamps.	Roof 12 Inches from the Center Line of Lamps.	Side of Box at Angle of 45° and 22" from Flame.	In 12-Inch Pipe.	In 10-Inch Pipe.	In 12-Inch Pipe.	In 10-Inch Pipe.
									Dry Bulb.	Wet Bulb.										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3	Gas.....	July 27	3.0	40	4	33.0	.....	29.85	91.5	79.5	118.0	.....	93.7	137	127	106	63.8	92.3	.....	1.220
4	"	" 27	3.0	0	4	33.9	.....	29.86	88.6	77.8	134.0	224	93.9	169	152	106	53.5	53.9	1.525	1.440
5	Oil, arg. burner.	" 28	2.2	40	2	33.2	.....	29.89	93.8	82.7	121.6	.....	96.2	149	140	110	59.7	89.0	.....	1.238
6	" "	" 29	3.0	0	2	33.9	.....	29.92	86.5	78.0	132.7	301	92.2	174	147	104	55.3	54.5	1.510	1.430
7	" "	" 29	3.0	40	2	31.8	.....	29.92	87.6	78.5	118.5	.....	90.1	151	135	101	61.4	85.4	.....	1.256
9	Gas.....	Aug. 4	2.0	0	4	31.9	3.27 cu. ft.	29.84	85.4	77.0	142.4	.....	87.7	.....	.....	99	88.2	.....	1.133	.....
10	"	" 4	3.3	0	4	32.3	3.27 "	29.84	84.2	76.2	142.4	.....	86.7	.....	.....	98	86.2	.....	1.133	.....
11	Oil, arg. burner.	" 5	1.5	0	2	33.3	.....	29.84	83.1	76.2	159.8	.....	85.6	.....	.....	108	66.3	.....	1.293	.....
12	" "	" 5	4.5	0	2	32.2	.333 lbs.	29.84	81.7	74.0	158.1	.....	84.5	.....	.....	104	65.2	.....	1.306	.....
21	" "	" 25	2.0	40	2	33.5	.344 "	29.69	84.3	78.6	112.3	.....	85.7	.....	.....	101	81.4	.....	.....	1.276
28	Oil, flat flame....	Sept. 13	2.7	0	2	.....	.146 "	29.70	79.0	71.5	111.0	.....	81.0	.....	.....	.....	62.4	.....	1.355	.....

NOTE.—In tests 9 to 12, and in test 28, a special cover was placed over the testing box, so that all the air passing through the 12-inch pipe passed also through the 10 inch pipe. These tests measure directly the total heat of the combustion of the gas and oil. In all the other tests the apparatus was arranged as shown in Fig. 1.

TABLE IX.—*Special Tests with a Steam Radiator in Testing Box to Determine the Heat Corresponding to Given Anemometer Readings and Changes of Temperature.*

Number of Test.	Date of Making Test.	Duration of Test, in Hours.	Temperature of Air, in Degrees F.				Barometer, in Inches of Mercury.	Pressure of Steam in Radiator, in Pounds per Sq. In. above Atmosphere.	Temperature in Degrees F.		Weight of Steam Condens'd per Hour, in Pounds.	Time for Anemometer to Register 100 Feet, in Seconds.		Volume of Air, in Cu. Ft. per Second, Calculated from the Heat given up by the Steam.	
			Entering 12-In. Pipe.		Leaving 10-Inch Pipe.	External Air near Testing Box.			Superheated Steam Entering Radiator.	Condens'd Steam Leaving Radiator.		In 12-Inch Pipe.	In 10-Inch Pipe.	12-Inch Pipe.	10-Inch Pipe.
			Dry Bulb.	Wet Bulb.											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
15	August 12	1.7	80.5	72.0	155.8	84.5	29.82	19.1	292.4	234.0	6.32	65.5	56.4	1.302	1.484
16	" 12	1.2	81.5	72.5	139.5	85.2	29.81	.8	261.5	182.4	4.05	86.2	67.8	1.133	1.254
17	" 24	2.0	81.5	72.5	124.2	86.1	30.04	5.9	269.4	137.4	3.10	71.0	55 2	1.232	1.329
18	" 24	1.5	81.5	73.5	133.4	87.2	30.02	13.1	301.0	149.0	4.00	67.8	54.2	1.307	1.432
19	" 25	1.7	81.5	77.4	117.5	84.7	29.51	4.3	267.1	119.1	2.45	104.9	86.5	1.175	1.252

volume of air that would have to pass through the pipes per second to absorb the heat given up by the radiator, with the range of temperature that this amount of heat is observed to produce. To correct these volumes of air for the slight differences in the anemometer readings between the radiator and corresponding lamp tests, we measure the variations in the volumes corresponding to the anemometer velocities, as shown by the curves given in the figure, and apply these corrections to the volumes indicated by the radiator tests. That this method is a correct one, through a small range, is shown by the radiator calibrations of the anemometer in the 12 inch pipe. These calibrations are indicated by the curves in the figure, and it is seen that a curve passing through them will be about parallel to the curve which represents the volumes corresponding to the anemometer velocities. The fact that the curves just mentioned are parallel also, goes to show that the effect of difference in radiation of heat from the testing box was small enough to be disregarded.

As a general check on the air-measurements a special series of tests were made in which the anemometer was revolved slowly in circles of different diameters about the center line of the 12-inch pipe. The velocity was first taken at the center, then in a circle of small radius about the center, next in a still larger circle, and so on until the anemometer was moved around against the pipe itself. The velocities obtained in this way were considered to act over the annular area covered by the blades of the anemometer during its circular travel, and the weight of air for the annulus was thus determined. The sum of the weights for all the movements of the anemometer gave the total weight of air passing through the tube. A mean of 10 experiments made in this way gave the point so marked in Fig. 6. This point is practically in line with those obtained by the radiator tests.

A curve cannot be passed through the radiator test calibration for the anemometer in the 10 inch pipe. These calibrations are indicated in the figure by the dots inclosed in circles. The reason for this is that the great variation in temperature, and, therefore, in the density of the air in the 10-inch pipe, caused the rate of the anemometer to be materially different from that which it had at ordinary temperatures. In the case of the anemometer in the 12 inch pipe, however, the temperature of the air was about the same as that in which it was calibrated by revolving it at the end of a lever arm, consequently the results obtained by the radiator tests follow a definite law, and the volume of air as determined in the 10 tests where the anemometer was moved in concentric circles practically agrees, as we have already stated, with the results of the radiator tests.

In making the tests of the anemometers by revolving them at the end of a lever arm, great precaution was taken to prevent a draft from affecting the readings. Partitions were placed so that they tended to prevent a circular movement of the air about the room. The direction of revolution was also reversed after each test, so that any accidental draught in a given direction would be eliminated. Two observers noted the readings of the anemometers at each revolution, and a third recorded the time by means of a stop-watch. The durations of the tests was for from 5 to 15 minutes. After completing the tests the differences for each revolution were taken, to insure that all the revolutions had been recorded, and the total number of revolutions in the given time were then counted.

The results given in these tests, as represented in Fig. 5, appear somewhat irregular, on account of a certain amount of draught that could not be entirely eliminated from the air in the room, which caused the readings of the anemometer when revolved in one direction to be greater than when revolved in the reverse way. This irregularity does not, however, affect the accuracy of the average results indicated by the

curves shown in the figure. To plot the curves, the center of gravity of several groups of experiments were taken and the curve passed through the points thus obtained.

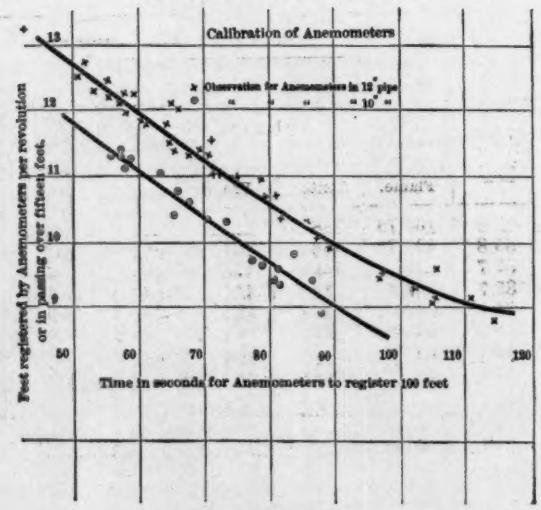


Fig. 5.

The record during one of the lamp tests is given in Table X., and the record for the corresponding radiator test in Table XI.

The following are the details of the calculations of this particular lamp test.

We first determine the volume of air that flows through the testing box in the special test with the steam radiator; we have, from Table XI.:

Weight of steam condensed per hour in pounds	6.32
Amount that steam entering radiator is superheated in degrees F	38.4*
Total heat of steam corresponding to observed steam pressure in B.T.U	1192
Temperature of condensed steam leaving radiator	234

The B.T.U. given up by the steam per hour will be—

$$6.32\ (.48 \times 38.4 + 1192 - 234) = 6171$$

Corresponding B.T.U. per second	1.714
Increase of temperature of air in passing through testing box in degrees F	75.3
Weight of air per second in pounds = 1.714 ÷ (.238 × 75.3) =	.0956
Volume of air in cubic feet per pound at temperature of entrance to 12-inch pipe	13.605
Volume of air in cubic feet entering 12 inch pipe per second = .0956 × 13.605	1.301

This value is represented by the cross marked 15 in Fig. 6.

In the lamp tests corresponding to this radiator test, the record of which is given in Table X., the temperature of the exit air and time required by the anemometer to register 100 feet were 159.8° and 66.3″. For the radiator tests the quantities are 155.8° and 65.5″. To correct for the difference in the anemometer readings we make use of the curve for the volume of air registered by the anemometer used in the 12 inch pipe given in Fig. 6. From this curve we find that the difference in the quantities of air for the readings is .009 cubic feet per second; the corrected volume of air in cubic feet per second for the reading of 65.5 seconds is, therefore, 1.301 — .009 = 1.292. The weight of air passing through the testing box in pounds per second is therefore $\frac{1.292}{13.671} = .0945$.

The range of temperature is 76.7° and the B.T.U. imparted to the air per second is .0945 × .238 × 76.7 = 1.726, and the corresponding heat per hour 1,726 × 60 = 6214 B.T.U. This heat is developed by the lamp when burning at 33.3 candle power. The heat per 32 candle power per hour will therefore be—

$$\frac{6214 \times 32}{33.3} = 5971 \text{ B.T.U.},$$

which is the figure given in Table I.

A wet-bulb thermometer was read during all the tests. This indicated that the percentage of saturation of the air varied from 53 per cent to 72 per cent. for all the lamp tests. The degree of saturation for the radiator tests is between 63 per cent. and 72 per cent. In the calculations we have assumed a constant degree of saturation as the amount of error by so doing as a maximum less than 1 per cent. of the total results obtained. In the tests for the total heat per pound of oil and per cubic foot of gas the correction for the moisture contained in the oil is less than ½ per cent. The effect of superheating the vapor of water in the products of combustion that is produced by the hydrogen in the oil or gas is less than ½ per cent. of the total heat involved. The degree of accuracy in the tests does not warrant the application of the small corrections given above, and they have therefore not been made.

Comparison of the Heats of Combustion Determined by Means of the Apparatus Herein Described, with those Calculated from the Analyses of the Oil and Gas.

Three analyses were made by Dr. Stillman on the oil used in the lamps; these agree very well with each other, and show that it contains 13.2 per cent. of hydrogen and 83.3 per cent. of carbon, the remaining ingredients being oxygen, nitrogen, etc. This oil is called "Mineral Seal" by the trade. It has a density of 40° Beaume, which corresponds to a specific gravity of .83. The flash test is 266° F. and the fire test 311°. It is a pure mineral oil.

The calculated heat of oil per pound is

Hydrogen	= 52,370 × .132 =	6,913 B.T.U.
Carbon	= 14,500 × .833 =	12,079 "
Total heat of combustion,		18,992

The average results obtained by the two experiments given in Table I. is 18,790, which is 1.1 per cent. lower than the value calculated from the analysis.

The heating power per pound of hydrogen employed above is that given by Favre and Silberman after the heat contained in the water vapor is deducted.*

In experiments on the heat of combustion of petroleum oils from Russia, by H. St. Claire de Ville, the heat of combustion by experiment was from 1.7 per cent. to 3.5 per cent. lower than the calculated value.†

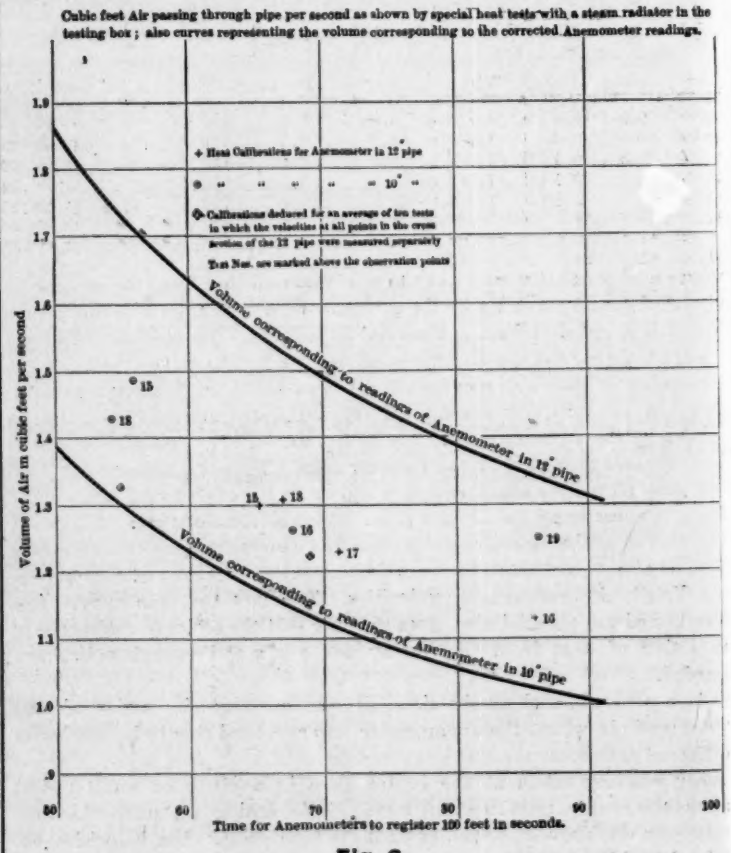

Cubic feet Air passing through pipe per second as shown by special heat tests with a steam radiator in the testing box; also curves representing the volume corresponding to the corrected Anemometer readings.
+ Heat Calibrations for Anemometer in 12" pipe
" " " " " " 10" "
Calibrations deduced for an average of two tests in which the velocities at all points in the cross section of the 12" pipe were measured separately
Test Nos. are marked above the observation points
Volume corresponding to readings of Anemometer in 12" pipe
Volume corresponding to readings of Anemometer in 10" pipe
Volume of Air in cubic feet per second
Time for Anemometers to register 100 feet in seconds.
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
.9
50
60
70
80
90
100

Fig. 6.

The results obtained for the petroleum oil are therefore in line with his experiments.

The analysis of the gas is not as precise as the oil analysis, for the hydrocarbons with the exception of the marsh gas present, are determined

* The reading of the thermometer corresponding to saturated steam was determined experimentally and a table compiled, which is employed in obtaining the above amount of superheating. This method eliminates any error in the thermometer.

* Heating power of one pound of hydrogen, including latent heat of water vapor, equals 62,032 B.T.U.—*Annales de Chemie et de Physique*, 1852.

† *Comptes Rendus*, 1871, page 192.

TABLE X.—*Test No.* 11, *Oil Lamps, Argand Burners.*

RECORD TAKEN BELOW PLATFORM.

Time.	Time for Anemometer to Register 100 Ft. in 12-Inch Pipe, in Seconds.	Temperature of Air Entering 12-Inch Pipe, in Degrees F.		Barometer, in Inches of Mercury	Photometer.			
		Dry Bulbs.	Wet Bulb.		Time to Burn 10 Grains of Candle, in Sec.	Correction for Rate of Burning.	Candle Power by Photometer Scale.	Corrected Candle Power.
12 00	.....	.....	.....	.....	155	.968	17	16 5
12 25	68.25	83	76.5	29 84	.....	.....	.....	.....
12 30	.....	.....	.....	.....	155.5	964	17	16.4
12 45	67	83.5	76.5	29.84	.....	.....	.....	.....
12.55	71.5	83	76.5	29.84	.....	.....	.....	.....
1.00	.....	.....	.....	.....	151	.993	16.5	16.4
1.15	68.75	83	76	29 84	.....	.....	.....	.....
1 25	64	83	76	29 84	.....	.....	.....	.....
1 30	.....	.....	.....	.....	156 25	.960	18	17.3
1.45	63 75	83	76	29.84	.....	.....	.....	.....
1.55	61	83	76	29 84	.....	.....	.....	.....
Aver.	66.3	83.1	76.2	29.84	.....	.....	.....	.....

RECORD TAKEN ON PLATFORM.

Time.	Temperature of Air in Degrees F.						
	Outside Air Near Testing Box.	Side of Box at Angle 45° and 22" from Flame.	Air Leaving 10-In. Pipe, Measured by Five Thermometers.				
			Center.	Front.	Back.	Right.	Left.
12.30	85 8	106 75	158	156.5	159	158.5	159
12 45	85 8	106.75	158	157	159	157	158
12 55	85.7	107	159	158	160	159	159
1.15	85.7	107 5	160 5	158.5	160	160 5	160.5
1.25	85 5	107.75	160 5	159	161	161	160.5
1.45	85.5	108 75	161	160	162	162	162
1 55	85 4	109 5	162	160	162	162	162
Average	85 6	107.7	159 9	158.4	160 4	160	160.1

Final average for air in 10 inch pipe = 159.8° F.

TABLE XI.—*Special Test* (*No.* 15), *with Radiator in Box. August* 12, 1892.

RECORD TAKEN BELOW PLATFORM.

Time.	Temperature of Air Entering 12-Inch Pipe, in Degrees F.		Barometer, in Inches of Mercury.	Time for Anemometer to Record 100 Ft. in 12-Inch Pipe, in Seconds.	Weight of Steam Pail, in Pounds and Ounces.		
	Dry Bulb.	Wet Bulb.			Initial.	Final.	Difference.
P.M							
10.30	77.0	69.0	29.82	63.5	21— 4.00	.....	.....
10.40	79.5	71.5	29.82	63.5	.....	.....	.....
10.50	80.0	72.0	29.82	65.0	.....	.....	.....
11.00	80.5	72.5	29.82	67.0	19-- 4.75	24— 6.50	3— 2.50
11.10	81.0	72.5	29.82	64.5	.....	.....	.....
11.20	81.0	72.5	29.82	64.0	.....	.....	.....
11.30	81.0	72.5	29.82	64.5	22- 12.25	22— 7.50	3— 2.75
11.40	81.5	72.5	29.82	67.0	.....	.....	.....
11.50	81.5	72.5	29.82	63.5	.....	.....	.....
12.00	81.5	72.5	29.82	.....	21 -- 4.75	25 -14.50	3 - 2.25
12.10	81.5	72.5	29.82	66.0	.....	22 -14.25	1 9.50
12.15	....	.....	.....	.....	.....	.....	.....
Aver.	80.5	72.0	29.82	65.5	.....	.....	11— 1.00

RECORD TAKEN ON PLATFORM.

Time.	Temperature of Air Leaving 10-Inch Pipe.						Time for Anemometer to Register 100 Ft. in 10-Inch Pipe, in Seconds.	Pressure of Steam in Radiator, in Pounds per Sq. In. above Atmosphere.	Temperature of Superheated Steam Entering Radiator, in Degrees F.	Temperature of Water Condensed from Steam Leaving Radiator, in Degrees F.	Temperature of External Air, Degrees F.
	Center.	Front.	Left.	Right.	Back.	Average.					
P M											
10.30	153.0	153.0	152.6	154.4	150.0	152.6	57.75	19.25	303.0	238	82.9
10.45	154.0	154.0	154.4	156.2	154.0	154.5	61.75	19.25	312.0	237	83.6
11.00	156.0	155.0	155.7	157.1	155.0	155.7	54.0	19.0	303.0	234	84.3
11.15	156.0	156.0	156.2	158.0	156.0	156.4	56.0	19.25	299.0	234	84.7
11.30	153.0	156.0	155.3	157.1	155.0	155.9	56.5	17.75	289.0	229	85.
11.45	157.0	157.0	157.1	158.9	157.0	157.4	55.0	20.0	284.0	235	85.1
12.00	156.5	156.2	156.5	158.0	156.5	156.7	54.75	19.75	276.0	234	85.2
12.15	157.0	157.1	157.1	158.9	156.0	157.2	55.5	18.25	273.0	231	85.3
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aver.	.....	.....	.....	.....	.....	.....	155.8	56.4	19.06	292.4	234	84.5

as a whole. An average of two analyses gives the following per cents. by volume:

Hydrocarbons, with the exception of marsh gas	38.1
Carbon monoxide	0.5
Marsh gas	57.7
Hydrogen	3.4
Nitrogen	0.3

If the 38.1 per cent. of hydrocarbons are assumed to be divided into benzole vapor = 10 per cent., propylene and olefiant gas = 18.1 per cent., the theoretical heat of combustion per cubic foot at the temperature at which the experiments were made is 1,337 B.T.U. If the division is made so that the benzole vapor = 5 per cent., propylene = 10 per cent. and olefiant gas 23.1 per cent., the total heat of combustion per cubic foot is 1,231 B.T.U.

In calculating the theoretical heat of combustion, the effect of the latent heat of the water vapor has been allowed for. The heats of combustion of the hydrocarbons employed are those determined experimentally by Julius Thomsen.‡

The heats calculated from the analyses therefore fall in line with the experimental results for both the oil and gas.

THE Jamaica Plain (Mass.) Company's main offices have been remodelled and greatly improved. Both customers and clerks will appreciate the changed conditions.

‡ For the method of allowing for the water vapor present, and the transformation from the heats per molecule, as given by Thomsen to British units, see *Stevens' Indicator*, Oct., 1892.

The Use of Asphaltum for Reservoir Linings.

[Read by Mr. Jas. D. Schuyler, C.E., at the December meeting of the American Society of Civil Engineers.]

For a number of years past experiments have been made in rather a small way in various parts of California in the use of asphaltum for reservoir linings, particularly in the southern portion of the State, where the natural product abounds in a great variety of forms, from hard rock to liquid "mineral tar," so called, oozing from the ground in springs. The natural properties of asphalt seem to render it a useful material from which to form a water-tight coating for reservoirs. It is insoluble in water, and neither acids nor alkalies dissolve it or affect its cohesion; hence it imparts no taste or color to water coming in contact with it. It is elastic and will yield to a considerable settlement of the surface on which it lies without cracking or losing its integrity. It is easily repaired, and new material can be made to unite perfectly with the old, wherever a patch may be needed.

The writer has had occasion to examine a number of small reservoirs so lined, and in almost every case found them in satisfactory condition and generally impervious to water. One of these that had been in use for four years at the town of San Buena Ventura, was an extreme example of the serviceability of asphalt. A circular reservoir about 100 feet in diameter and 10 feet deep had been excavated in light, sandy and gravelly soil for perhaps one-third of its depth, the material excavated being used in the embankments. This was paved on the bottom and sides (sloping 1 to 1) with cobblestones laid in mud, the spaces between

being partially filled with the mud mortar. When dry this rude masonry was covered with a thin coat of liquid asphalt, poured on hot and spread with brooms. The thickness of the sheet did not exceed ½ and in places was not over 1/16 of an inch thick. The reservoir was not covered. After being filled with water, one portion of the banks was said to have settled outward more than 2 feet without breaking the integrity of the lining. The cost of the lining was very small; it has required few repairs, and bids fair to render service indefinitely. Another reservoir examined by the writer was excavated in firm shale and soft sandstone, with nearly vertical sides, on which the hot asphalt was successfully applied. This was a small house service supply reservoir, and had been a year in use without repairs when examined.

Other instances of the use of asphalt to repair cracked and broken concrete linings of reservoirs were noted, in all cases with success. The writer subsequently constructed on his own premises a circular reservoir 64 feet in diameter, 7 feet deep, which he lined with asphalt ½ inch thick. The side slopes were 1 to 1, and the first coat, consisting of a mixture of 15 per cent. of La Patera asphalt (which contained, by analysis, 66 per cent. of pure bitumen) and 85 per cent. of beach sand, after being heated to a temperature of 300° was spread with hot rakes and consolidated by means of hot tampers and smoothing irons. It was laid in sections 2 feet wide, half the height of the slopes. The edges should have been painted with pure liquid asphalt before the adjoining section was laid next to it, and it was, doubtless, owing to a neglect of this precaution that, after being in use one year, small cracks appeared, outlining the joints where the various sections were laid. These cracks were all repaired, however, with half a barrel of asphalt and the labor of one man for three days, and the reservoir is in perfect condition after two years, although exposed to the sun. The sheet of asphalt was tacked to the slope by means of strips of strap iron 6 inches × ½ inch × ½ inch, driven in at intervals of 18 inches in each direction. A second coat, consisting of La Patera asphalt fluxed with about 10 per cent. of "mineral tar," the heaviest of the natural oils of California, heated to a temperature of about 250° F., was applied over the entire surface. It was poured on as thinly as possible and ironed down with hot smoothing irons. Its thickness averaged about ½ of an inch.

With this experience, and after a careful examination of the principal asphalt beds of Southern California, as well as the sea walls laid in asphalt and described by W. C. Ambrose, M. Am. Soc. C. E., in Vol. XXIV. of the *Transactions* of the Society, the writer felt justified in recommending the use of California asphalt for the lining of two large distributing reservoirs constructed at the city of Denver, Col., by the Citizens Water Company. These reservoirs, known as the East and West Ashland Avenue Reservoirs, lie side by side, and were excavated to their full depth of 32 feet on the upper or higher side, the material being used to form artificial embankments on the lower side, where the minimum depth of excavation below the natural surface was 6 feet. They are intended to be filled to a depth of 26 feet, and there was, therefore, on one side 20 feet in depth of water to be supported against a made bank. The whole of the West and a portion of the East Reservoir were excavated during the winter of 1890–91, when there was a good deal of frost in the ground, and although a 12-ton steam roller was employed to consolidate the banks, a considerable settlement was anticipated, which would have been fatal to a concrete lining.

The dimensions of the West Reservoir were as follows: bottom, 341 × 256 feet; top, 350 × 420 feet; maximum depth, 32 feet; depth to roof line, 29 feet; depth to high-water line, 26 feet; side slopes, 1.33 to 1; capacity, 22,000,000 gallons. East Reservoir: bottom, 152 × 494 feet; top, 236 × 580 feet; depth, slopes and capacity the same as the West Reservoir.

The material excavated consisted of 2 or 3 feet of sandy loam, 12 to 15 feet of hard clay impregnated with alkali, and 8 to 12 feet of shale, the "bed rock," so called, of the country. On the completion of the embankment the slopes were sprinkled and rolled with a slope roller weighing 5 tons, drawn up the slopes and lowered by an engine placed on a track along the top of the banks.

At the time the West Reservoir was completed and ready for lining, it was found impossible to get the amount of California asphalt needed within the time available, and it was decided to use Trinidad asphalt, which could be obtained on the ground from the Barber Asphalt Company, then engaged in paving the streets, and having in operation a capacious plant for melting and mixing the materials. A contract was made for the delivery of the materials at the reservoir, at a given rate per day. It had to be hauled in wagons about 2½ miles, and as the roads were muddy and the weather cold, some of the asphalt chilled on the way and had to be rejected. All that was put on was supposed to be of a temperature of 250° and over. Beginning at the bottom, the slopes were laid in horizontal strips about 10 feet wide, the thickness averaging about 1¼ inches. It was spread with hot rakes, tamped as hard as possible with square tampers, kept hot and frequently changed, and ironed with heavy, hot smoothing irons. While the sheet was still warm, anchor spikes, cut from strap iron, 1 × ¼ inch, 7 to 8 inches long, were driven through the asphalt into the bank, in rows 1 foot apart, about 12 inches from centers in the rows. Every other row was driven down flush with the surface, the alternate rows being allowed to project 1½ inches above the surface temporarily, to serve as a rest for strips of 2 × 4 inch lumber, placed loosely above them on the slope, thus forming steps for the workmen to ascend while working on the space above. When the finishing coat came to be applied, these projecting spikes were driven flush and all painted over. The bottom thickness was about 1 inch. After spreading and tamping, it was rolled with a cold steam roller weighing 5 tons. The finishing coat of refined Trinidad asphalt, fluxed with residuum oil, was poured on hot, from buckets shaped like a coal hod, and ironed over with hot smoothing irons, heated to a cherry red. These irons had to be passed over the surface quickly, and when first applied produced a yellow smoke; but it was found that perfect cohesion with the first coat could not be secured except by thorough ironing with very hot smoothers. When finished the surface had a bright, glossy appearance, as though varnished. The cost of this work was as follows:

First Coat.

1,304 tons, 20 per cent. asphalt mastic, 80 per cent. sand, at $12	$15,648 00
15 tons, 15 per cent. asphalt mastic, 85 per cent. sand, at $10	580 00
86.21 tons liquid asphalt, fluxed with oil, at $40	3,448 40
Fuel for heating irons and for steam roller	276 02
Lights	36 00
Tools	179 75
Peg irons—material, cutting and dipping in asphalt	650 00
Labor	1,921 50
Use of roller six days	60 00
Total	$22,799 67

Area of surface covered, 152,580 square feet. Cost per square foot, 14 24/100 cents.

The East Ashland Avenue Reservoir was lined with California asphalt in July and August of the current year. The material was furnished from the Santa Barbara county beds of the California Petroleum and Asphalt Company, the asphalt being from the La Patera mine, and the flux from Las Conchas mine, near Carpinteria; was prepared on the ground by the Blake Asphalt Company, of Denver.

The La Patera asphalt mine is one of the most interesting deposits of rock asphalt on the Pacific coast. It was discovered four years ago by an outcrop a few feet from the shore of a small estero, within 100 yards of the surface of the ocean. The principal part of the deposit seems to be below the level of the ocean, the lowest workings being now 70 feet below tide level. The asphalt is mined out in masses of from 1 to 20 cubic feet, by means of long wedges. A peculiarity of the mining is the fact that all picks and wedges become sharper with use and soon take on a keen edge. The asphalt is brittle, is easily mined, and is not sticky, nor does it run together in a solid mass on being piled in the sun. It is remarkably uniform in quality, and carries 55 to 68 per cent. of bitumen, of which but 9.24 per cent. is volatile at 1,100° F. It is sold at the mine for $20 per ton. The fluxing material known as Las Conchas asphalt, is obtained from an extensive deposit along the sea shore near Carpinteria, some 30 miles east of the La Patera mine. It is richer in oils and will volatilize 4 per cent. at 300°, and 86.25 per cent. at 1,100 F. It carries 12.58 per. cent. of non-volatile or "fixed" bitumen, besides the 86.25 per cent. volatile at 1,100°, or a total of 98.83 per cent. of bituminous matter, and 1.17 per cent. of mineral. The process of extracting it from the sand in which it is found is by passing it through a long cylinder of peculiar construction, called a "cochleon," which is made to revolve in vat of boiling water. The sand passes out of the end of the cylinder clean and white, while the asphalt floats to the surface of the water, and is then specially treated with hot compressed air to drive off the moisture. It is shipped in barrels, and is a viscous mass, of somewhat less fluidity than "cold molasses" in ordinary summer temperature.

In preparing the mastic for coating the reservoir, the proportion of the La Patera asphalt and Las Conchas flux used was about 78 per cent. of the former to 22 per cent. of the latter. It was boiled in open kettles for about 12 hours, at a temperature of 250° to 300°, and frequently stirred to prevent burning or sticking to the bottom. The sediment that settled to the bottom of the kettle was removed with long-handled

shovels, and used later on in another portion of the work for an asphalt concrete. For the first coat, 20 per cent. by weight of this mastic was mixed with 80 per cent. of sand (previously heated to the same temperature), in a cylinder provided with strong paddles. The mixing occupied about two minutes, when the charge was dumped into a cart standing underneath the mixer, whence it was conveyed to the bottom of the reservoir and there dumped upon wooden platforms, and thence taken in hot scoops to the spot where it was applied. The spreading and raking were similar to that described in the other reservoir, but the compression of the asphalt was accomplished by means of hot rollers, instead of cold rollers, tamping irons and smoothers, a method which accomplished the work in a superior manner to the former process. These rollers are formed from sections of cast iron pipe, turned off smooth upon the outer surface, and fitted with a hanging fire basket inside the cylinder, in which a fire was maintained. For the bottom work a 30-inch pipe was used, and for the slopes the pipe was but 10 inches on account of the weight. This was pulled up the slopes by means of a ⅝-inch wire cable, passing over a pulley at the upper end. Six to seven men were required to manipulate this roller, besides a man to guide the roller with a long handle. The result of hot rolling was to consolidate the sheet of asphalt into a compact mass, driving out the air and producing more perfect cohesion of the particles than is possible by tamping, ironing or cold rolling, for the reason that the asphalt is worked while it is still hot, and the roller passes over it so quickly and presses it so thoroughly that it has no opportunity to chill or cool off before it is compressed, and the hot roller keeps up its temperature until the work of consolidation is complete. Hot rolling is as essential to perfect work in asphalt as thorough tamping is to successful results in cement concrete.

The weight of the mixture of asphalt and sand, after being compressed, was found to be 127 pounds per cubic foot. The total surface area covered below the roof line was 143,667 square feet, requiring 2,302,837 pounds of the mixture, or about 16 pounds per square foot. This gave an average thickness of the sheet of 1.53 inches. The sheet of asphalt was pinned to the slopes in a similar manner to that employed in the other reservoir, the pins being driven 1 foot apart in alternating rows, except when the shale was too hard to admit of the strap irons being driven into it. This occurred over about one-fifth of the area, and there heavy sixpenny steel wire spikes were driven somewhat closer together.

The second or paint coat of pure asphalt was applied after the first coat was completely finished, and was thoroughly ironed with red hot smoothers, to secure as perfect adhesion with the first coat as possible. This result was attained perfectly, except in spots where dirt had become ground into the surface of the first coat by the tramping of muddy boots after rain. The most satisfactory way to insure a perfect contact and cohesion of the two coats is undoubtedly to apply the second coat immediately after the first is laid and while the latter is still warm and clean, but there were many little reasons and objections raised by the "expert foreman" to this method of doing the work, which might have been overcome and should be overcome in the execution of any similar work to insure the most perfect results. The thickness of the second coat is from ⅛ to ¼ inch. It has a leathery consistency, toughness and elasticity, and although it manifests a tendency in warm weather to creep and gather in wrinkles down the slopes in both reservoirs, it never breaks and remains impervious to water. The total amount of asphalt used on the second coat of the east reservoir was 178,470 pounds, or 1.24 pounds per square foot.

The cost of materials was as follows:

First coat	8.98	cents per square foot.
Second coat	2.48	" " " "
Total	11.46	" " " "
Labor, fuel, spikes, etc., cost for both coats	1.99	" " " "
Total cost for labor and materials	13.45	" " " "

When the interior lining of the east reservoir was finished, the slopes above the roof line of both reservoirs were covered with a heavy coating of asphalt, 2½ to 3 inches thick. This was carried entirely over the top of the embankment between the two reservoirs, and for a width of 5 feet over the top of the banks surrounding them, forming a substantial pavement or pathway entirely around each, at a cost of $4,218.59 for materials and about $700 for labor.

The total expenditure on both reservoirs on account of asphalt work was $48,498.69, or about $1,100 per 1,000,000 gallons of storage capacity. A reasonable estimate of the cost of lining these reservoirs in an equally substantial manner with cement, concrete, brick or stone, exceeds this figure 100 per cent., although this was not the chief motive for adopting asphalt in preference to other materials.

At the time the west reservoir was lined the embankments were fresh and had been hastily constructed; the reservoir was imperatively needed for immediate service, and a material for lining was required that would stand the vicissitudes of the emergency without serious impairment. The result proved the wisdom of the choice, as settlement did occur, although not as great as was anticipated. A fissure was opened in the lining about 10 feet below the roof line, on the highest part of the made bank, the crack being some 6 inches wide and 100 feet in length, but it was repaired without drawing the water off, at an expense of $20. During the past winter a severe test was applied to the lining to prove its tenacity and hold upon the bank. Ice formed to the thickness of 18 inches when the water stood within 8 feet of the top, and, while it was frozen fast to the lining all around, the water was lowered and raised again 3 to 4 feet, without the slightest injury to the asphalt. There was not the same urgent reason for lining the east reservoir with a flexible material, as the embankments had a year's settlement and were reasonably solid; but with a year's experience in the west reservoir, and a feeling of confidence in being able to improve upon the method of lining, as well as upon the materials and mixtures, there seemed no good reason to change for a more costly lining.

A few of the special difficulties encountered in the work may be of interest in the way of suggestion. A small quantity of seepage water, following the seams in the shale near the bottom of each reservoir, had to be taken care of, and caused no little annoyance. It was insignificant in quantity—not exceeding one gallon per minute in all—and was disposed of by cutting deep drains in the bottom and up the slopes as high as the moisture appeared, filling them about 1 foot deep with broken stone, covering them with plank, and then ramming in earth to the top. These drains converged to collecting wells, into which short sections of 12 inch cast iron pipe, with the bell ends turned upward, were inserted; and these were kept baled out during the progress of the work. The asphalt was brought up to these pipes, and well cemented to them. When the lining was completed, these pipes were capped with light cast iron plates, fitting into the bells, in the center of which was placed a 2 inch flap valve made of sole leather, with an iron disk on top to hold it in place against a pressure of a few ounces. These are sufficient to admit the water freely into the reservoir when it is empty, without exerting any appreciable lift upon the asphalt sheet, while they will close to prevent leakage when the pressure in the reservoir exceeds that of the subsoil waters. There are about 15 of these valves in the two reservoirs. They seem to serve in a satisfactory manner the purpose for which they were designed.

The crumbling of the surface of the slopes, when dry, especially after a little rain, caused no little inconvenience, as the dirt rolling down would become mixed with the hot asphalt, as it was being applied to the slopes. To remedy this a portion of the slopes of the east reservoir was plastered with a thin coat of cement, lime and sand mortar, about ¼ inch thick. This, when dry, made a smooth, clean surface on which to lay the asphalt. The writer is inclined to the opinion that wherever asphalt is used on earth slopes of reservoirs, this preliminary plaster coat should in all cases be applied; and it should be laid with care, nearly 1 inch thick, the cost of which should not exceed 5 cents per square yard. On this should then be spread a thin coat of liquid asphalt, similar to the finishing coat, as the foundation for the paving mixture with sand, which latter may advantageously be reduced in quality to about 16 per cent. of mastic to 84 per cent. of sand. This method of lining would render the paving coat impervious to subsoil water as well as to the water of the reservoir, and thus preserve it from the slight tendency to softening under the action of water, wherever compression is not perfectly accomplished and the sheet is at all porous. The finishing coat of liquid asphalt really constitutes the lining. The paving, or body coat of asphalt and sand, which is a body for the finishing coat to cling to, is only impervious to water where compression is absolutely perfect.

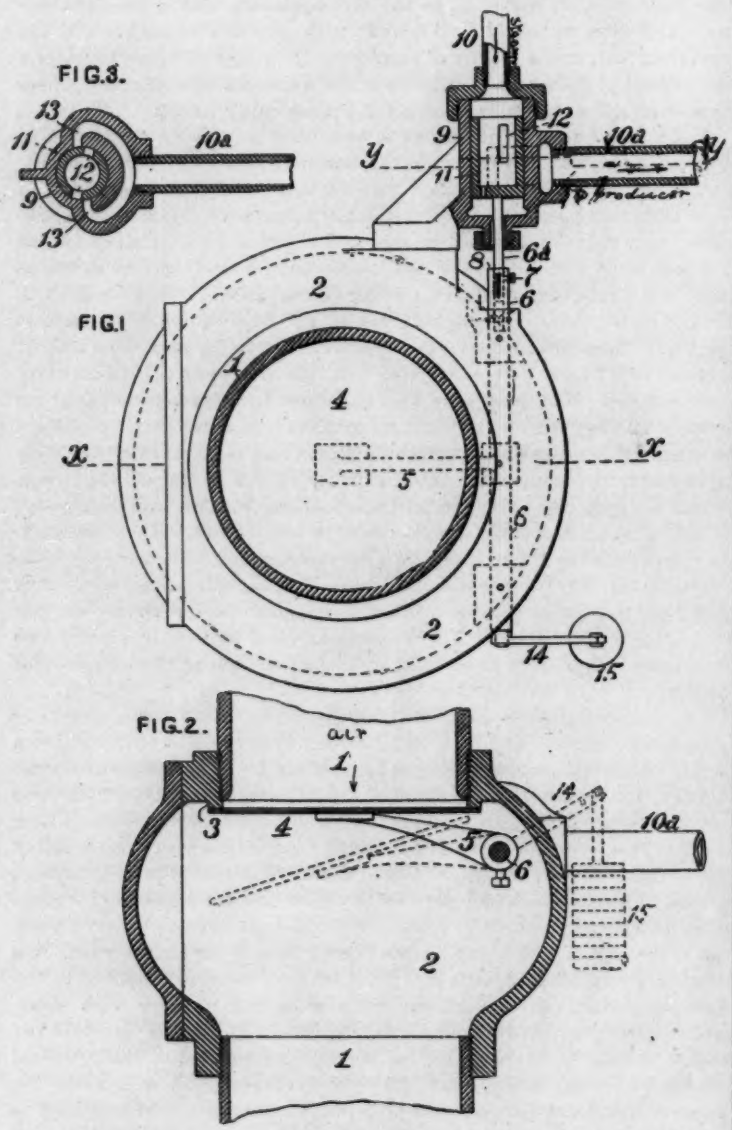
With the utmost care there will always occur spots where compression is imperfect, due to a variety of causes, most potent of which is inequality of cooking, the occasional burning of a batch, the application of it at too low a temperature, the slight yielding of the foundation, the use of tools insufficiently hot, etc., etc. For this reason the writer recommends that the body coat be laid between two coats of the liquid or pure asphalt. By "pure" is meant a mastic containing at least 75 to 80 per cent. of bitumen. Under these conditions, and with the exercise of watchful care over every stage of the work, the writer believes that a reservoir lining may be made with asphalt that will be of indefinite serviceability.

Ruud's Automatic Steam Regulator for Gas Producers.

On September 6th U. S. Letters Patent (No. 482,320) were granted to Edwin Ruud, of Pittsburgh, Pa., for an inprovement in automatic steam regulators for gas producers. Using the words of the specification, the invention relates to the class of gas generating apparatus ordinarily termed "producers," in which the generation of gas containing a greater or less percentage of hydrogen is effected by the passage of blasts of air and steam through a body of ignited carbonaceous material in a furnace chamber or producer.

The normal and successful operation of a gas producer, as well as the composition of the gas generated and its effective utilization as fuel, depends largely upon the admixture in proper proportions of the air and steam delivered to the producer; and the object of the invention is to automatically regulate the quantity of steam passed into the producer proportionately to that of the air blast, so that when the apparatus is adjusted for operation with any determined charge a limited variation of

FIG. 3.



the air blast shall be accompanied by a corresponding variation of the steam blast in order to maintain a practically uniform percentage of hydrogen in the evolved gas.

To this end the invention, generally stated, consists in the combination of an air and a steam blast pipe, valves controlling the passage of fluid through said pipes, a shaft by which said valves are coupled and caused to move coincidentally in opening and closure, and a counterbalance coupled to said shaft and acting thereon in opposite direction to the opening movement of the valves.

The improvement claimed is hereinafter fully set forth. In the accompanying drawings, Figure 1 is a plan view, partly in section, of an apparatus embodying the invention; and Figs. 2 and 3, vertical sections at the lines $x\,x$ and $y\,y$, respectively, of Fig. 1.

In the practice of the invention there is interposed between two sections of, and at any convenient point in the length of the air blast pipe 1, leading to a gas producer, a valve case or chamber 2, having formed upon it a face or seat 3, which surrounds the opening of the adjacent connected section of the air blast pipe, and upon which an air regulating valve 4, which controls the passage of fluid through said pipe, is adapted to close. The valve 4 is fixed upon the free end of an arm 5, the opposite end of which is secured upon a shaft 6, journaled in bearings in the shell of the valve chamber 2 and projecting outwardly through the same. The shaft 6 is extended, preferably, as shown, by an adjustably connected supplemental section 6a into a valve chamber 9, which is interposed between and connected to two sections 10 and 10a of the steam blast pipe, the supply section 10 leading from the generator to the valve case, and the delivery section 10a leading from the valve case to the producer. A steam regulating valve 11, fixed upon the shaft section 6a, is fitted to move circumferentially in unison with said shaft section in the valve chamber 9 and to control the passage of steam from the section 10 of the steam blast pipe through the valve chamber to the section 10a and producer. The valve 11 is in the form of a cylindrical shell, which is open at its end adjoining the supply steam pipe section 10, and should be provided with one or more openings in its opposite end to maintain it in proper longitudinal balance. Ports 12 are formed in the shell of the valve 11, said ports being adapted in the traverse of the valve about its axial line to register with ports 13, formed in the shell of the valve chamber 9 and leading to the delivery pipe section 10a, the passage of steam from the supply to the delivery sections being regulated or wholly cut off, as the case may be, by the greater or less degree of opening of the ports 12 to the ports 13, or the total closure of the ports 12 by being brought opposite to closed portions of the shell of the valve chamber. A balance arm 14 is fixed upon the shaft 6 exterior to the valve chamber 2, said arm projecting from the shaft in opposite direction to the arm 5, to which the regulating valve 4 is secured, and having its outer end coupled to a suitable counterbalance, in this instance an adjustable weight 15, the gravity of which acts against the incoming pressure of air on the valve 4 and the gravity of said valve and tends to close the same, such closure being effected to a greater or less degree coincidentally with corresponding reduction of air blast pressure. A spring acting by its tension correspondingly to the gravity of the weight may, if desired, be substituted as a mechanical equivalent of the latter.

The supplemental shaft section 6a is fitted freely in a longitudinal central bore in the main section 6, so as to be movable and adjustable endwise therein, and is secured in adjusted position by a set screw 7. Such capacity of longitudinal adjustment is provided in order to vary the degree of steam admission relatively to that of air admission for a determined valve traverse, so that the relative proportions of the former and the latter may be regulated as desired by causing a greater or less length of the valve ports 12 to register with the valve chamber ports 13 by the movement of the supplemental shaft section 6a and connected valve 11 toward or from, respectively, the adjoining main shaft section 6.

The proportionate opening of the steam ports is indicated by an index 8, secured to the shaft section 6a and projecting through a longitudinal slot in the shaft section 6, a series of graduations being marked on the latter adjacent to the slot.

In operation the pressure of the air blast in the pipe 1 overcomes the resistance of the weight or spring connected to the arm 15 of the shaft 6 and opens the air regulating valve 4, coincidentally rocking the shaft section 6 in its bearings and with it the connected supplemental section 6a and steam regulating valve 11. The movement of the valve 11 coincidentally opens a passage for steam to the producer, the degree of opening being by the connection of the two valves increased or diminished coincidentally with and proportionately to variations in the degree of opening of the valve 4, the quantity of steam admitted to the producer thus bearing a constant determined ratio to the quantity of air.

Concluding, the inventor says: I am aware that means for proportionately varying the supply of two different fluids, as valves controlling gas and steam pipes or gas and air pipes, respectively, and coupled one to the other by intermediate lever connections, so as to coincidentally and proportionately regulate the supply of the respective fluids, were known in the art prior to my invention, and such constructions, broadly, I therefore distinctly disclaim.

I claim as my invention and desire to secure by letters patent—

1. The combination of an air blast pipe, a steam blast pipe, valve chambers interposed between sections of each of said pipes, a regulating valve controlling the air blast pipe, a shaft journaled in bearings and connected to said valve, a regulating valve connected to said shaft and fitted to move circumferentially within the valve chamber of the steam blast pipe, and having ports adapted to register with ports formed therein, and a counter balance connected to the valve shaft and acting

thereon in opposite direction to the opening movement of the valves, substantially as set forth.

2. The combination of an air blast pipe, a steam blast pipe, valve chambers interposed between sections of each of said pipes, a regulating valve controlling the air blast pipe, a shaft journaled in bearings and connected to said valve, a regulating valve constructed to move longitudinally and circumferentially within the valve chamber of the steam blast pipe, and having ports adapted to register with ports formed therein, a shaft secured to said valve and connected adjustably to the shaft of the regulating valve, and a counterbalance coupled to the valve connecting shafts and acting thereon in opposite direction to the opening movement of the valves, substantially as set forth.

The Gasholder Tanks of the Bay State Gas Company.

[Read by Mr. A. P. Boller, C. E., at a meeting of the Am. Soc. Civil Engineers.]

The plant of the Bay State Gas Company, built in 1886, is located near the pumping station of the Main Drainage Works of the City of Boston, on Dorchester Bay, and on original marsh land flooded at high tides from the bay. It was designed by the late Joseph Flannery, a leading gas engineer of Philadelphia. The gas holder tanks of this plant about to be described, and to which the writer's relation was simply that of a contractor, are interesting from their magnitude, the speed with which they were constructed, and the manner in which the work was carried out. There are two tanks built of brick, about 30 feet apart, each having an inside clear diameter of 152 feet, with foundation footings sunk about 30 feet below the level of the marsh. The leading dimensions and arrangement of column piers and roof supports are shown upon the drawing. They were built between the first of June and Christmas of the same year, except the coping (of granite) on No. 2 tank, which severe weather delayed until the following spring.

By the terms of the contract, the contractors were to do their own engineering and inspection under the plans furnished, the principal requirement being that the tanks should be guaranteed water tight and true to circle. The material used was hard burnt Eastern brick, laid in improved Union cement, and coarse gravel concrete made with Portland cement.

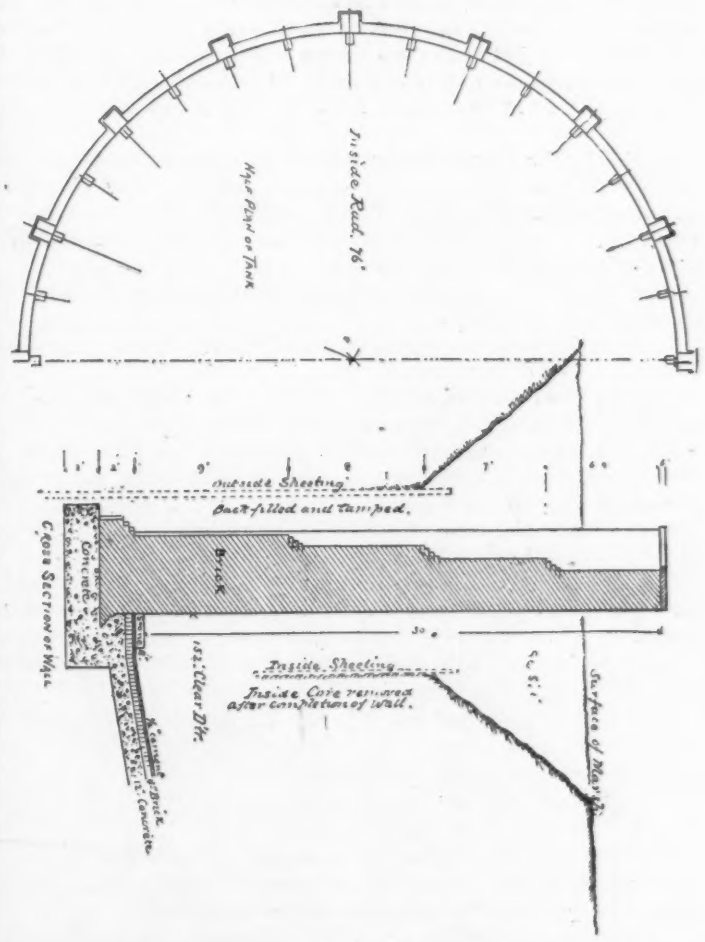
The physical conditions under which the tanks were to be constructed were rather forbidding, particularly in view of the difficulties met in securing the foundations for the pumping station of the drainage works some 500 feet away from the site of the tanks. No borings had been taken, it being assumed that the material to be gone through was substantially of the same character as that met with at the pumping station, starting with the marsh mud, stiffening up as clay, and reaching the sand, which was strongly water bearing as would be expected. The enormous area occupied by each tank dictated large pumping capacity.

The mode of construction adopted was as follows: The site of the tanks and construction plant, covering some two acres, was first diked off from the sea, which flooded the marsh at high tide. Immediately between the tanks a sump well 10 feet square was sunk and planked up, into which all drainage was to be carried. The pumping plant consisted of two 80-horse power locomotive boilers, and four Andrews centrifugal pumps, two 6 inch and two 8 inch discharge, forming a duplicate plant, it being expected that one of each size pump would be amply sufficient to care for the water under the plan of construction adopted, the other set being a relay in case of accident.

In sinking the sump, much difficulty was experienced about two-thirds the way down, from marsh gas; so much so that several workmen narrowly escaped with their lives, and all those who had come under its influence suffered from inflamed eyes for several days after withdrawing from the pit. It was only after a blower had been rigged up for forcing air down the pit and thus diluting and dissipating the gas, that work could be resumed and the bottom of the sump reached and planked with lateral connections to the tank. The walls of the tanks were built in excavations precisely as if a sewer was intended, the interior core being left for excavation after the completion of the walls. The wall excavation was sloped about 1 to 1 for 10 feet, when sheet piling was introduced, 4 inches (tongued and grooved) for the outside row and 2 inches for the inner row.

The sheeting in single lengths was mauled down as far as possible, when a small steam pile driver was mounted and the sheeting driven clear down below the concrete footing. The driver was a small machine consisting of a single square timber mast on the apex of a triangular base, the hammer of about 500 pounds grooved to slide over a tee rail guide secured to the mast. It was a very effective machine and easily handled.

This manner of putting in the tank walls required only a narrow excavation easily braced, reducing the demands on the pumps to a minimum. The excavations were carried on either way from the sump drains, and in sections of greater or less length as contention with water demanded. In building the brick work, to secure tightness, the bond was broken as irregularly as possible in the hearting of the wall (water abhors an angle), and to secure a thorough filling of the joints with mortar, the bricklayers were instructed to keep their fingers over the bricks and lay them a finger width apart. Each course of brick work was thoroughly grouted as the work progressed. The result was an exceedingly tight wall, as will be seen by the record hereafter given. As the wall was built up, the outside void formed by excavation was refilled with the excavated material and well rammed. The circular alignment was maintained, and vertically insured by frequent cheeks with a standardized steel ribbon revolved around a carefully maintained center hub and plumbing down from the end of the radius. This resulted in such



accurate work that little or no furring was required for setting the gasholder guides, and a trifling amount of cutting into the brick was required in only a few cases.

On the completion of the walls, the central core was rapidly excavated by means of three or four derricks handling yard buckets of material. Little or no difficulty was experienced in putting in the concrete bottom, excepting for about one third the length near the footings of one of the tanks, which was conquered section by section with sheeting, and boxing in a continuous drain below the concrete. Contrary to expectations, the water difficulty was not great, and barring a short section above noted in the first tank, where sand was struck, all the water met required only intermittent pumping. Almost the entire excavation, after passing the marsh mud, was in clay, and in the westerly tank no sand whatever was encountered, consequently little or no water was met on the completion of the work. The tanks were filled to their capacity, and the engineer, Mr. Flannery, reported as follows to his company: * * * "The records of the two gas tanks kept from the 9th instant indicate that in No. 1 no appreciable loss has obtained; that in No. 2 a loss of 4½ inches has obtained in each 24 hours, being from June 30th, 1:30 P.M., to 1:30 P.M. of the 11th instant, 5 inches; 11th to 12th instant, 4½ inches; 12th to 13th instant, 4 inches; which shows a constant betterment. That these tanks made so excellent a showing at this period of their history is unprecedented. No. 2 shows a rate of improvement which indicates an entire stoppage in the unaccounted for water in a few days. The evaporation at this season amounts to $\frac{5}{16}$ of an inch in 24 hours." * * *

Something about the Electric Service at the World's Fair.

According to the *Western Electrician* the rules relating to electric lighting and power service, as adopted by the National Commission, have not all been approved by the local company, and so are liable to change. It is believed, however, that the present arrangement will not be materially altered. The rules are appended :

Electricity for Incandescent Lighting Service.—All State and Territorial World's Fair boards, persons, firms or corporations who may desire to wire their respective buildings for the purpose of lighting same shall so install said wiring as to meet with the approval of the director of works before connections can be made with the main circuit.

All power service for generating light will be furnished during the exposition hours by the World's Columbian Exposition from the 1st of May to the 30th of October, 1893, at the rate of $8 per 16 candle power lamp capacity or the equivalent in lamps of other candle power. All changes in the location of lamps or appliances whence once installed will be made subject to an extra charge to be fixed and determined by the director-general and the director of works. The incandescent lighting circuit will be operated from 100 to 110 volt alternating circuits.

Electricity for Power Service.—First—All contracts to be made with exhibitors for power service shall be executed between said exhibitors, the director-general and the director of works, but the amount of power to be supplied to the exhibitor in each case shall be fixed and determined upon by the director-general.

Second—The electric motor shall be suitable to operate on a 500 volt constant potential circuit.

Third—The rheostat shall be constructed wholly of non-combustible material.

Fourth—The main line switch shall be of the knife blade type and suitable for working a 500 volt constant potential circuit.

Fifth—The motor shall be erected in position by and at the expense of the consumer and in a manner subject to the approval of the director-general and the director of works.

Sixth—The service connections to the motors shall be installed, maintained and owned by the World's Columbian Exposition.

Seventh—No service will be rendered for less than $20. Fractions of horse power will not be considered except for motors of less than 1 horse power.

Eighth—Charges will be made for service of connecting the main line at the following rates :

For ¼ horse power and less	$10	per horse power.
For 1 to 5 horse power	15	" "
For more than 5 horse power and not exceeding 10 horse power	12	" "
For more than 10 horse power	10	" "

Ninth—Charges for service will be based upon the maximum mechanical horse power delivered to the motor, irrespective of the class of work to be operated by motor, at the following rates :

For ¼ horse power and less	$20	per horse power.
For more than ¼ horse power and not exceeding ½ horse power	40	" "
For more than ½ horse power and not exceeding 1 horse power	75	" "
For more than 1 horse power and not exceeding 2 horse power	70	" "
For more than 2 horse power and not exceeding 3 horse power	60	" "
For more than 3 horse power	50	" "

Tenth—Special service for motors not exceeding 2 horse power can be urnished on ¼ alternating current incandescent circuit.

Electricity for Arc Lighting.—The aisles of the main building will be illuminated by arc lights free of expense to the exhibitor. A limited number of arc lights will be supplied for private lighting on the following basis, viz.:

First—The consumer shall pay the cost of wiring.

Second—The consumer shall pay for service from May 1 to October 30, 1893, at the rate of $60 per lamp of 2,000 nominal candle power.

Third—Lamps will be suspended from the ceiling and furnished with opalescent globes. If any special fixture is required, it shall be furnished by the consumer.

Fourth—All care and attendance to the lamps and circuits will be furnished by the World's Columbian Exposition without extra charge.

Electricity for Charging Storage Batteries.—First—The consumer shall provide lines and all material necessary from the local switchboard from which the current is to be distributed to storage batteries.

Second—The consumer shall provide all necessary labor and attendance connected with the charging or handling of the batteries.

Third—Current will be provided 110 to 220 or 500 volts, at the rate of 10 cents per electrical horse power per hour.

Electricity for Miscellaneous Purposes.—First—Electricity for special purposes will be subject to special agreement to be determined at the time of making application therefor.

Second—Rates will be based either on those of power or those for storage battery purposes, according to the class of work to be performed.

Rules Governing Light and Power in Electricity Building to be Supplied by the World's Columbian Exposition.—Exhibitors in the electricity building will be divided into two classes : First, those who contribute to the service of lighting and electric power transmission for the building. Second, those who do not so contribute.

Contributors will be again divided into two classes :

(1) Those who furnish generators connected to prime movers in Machinery Hall.

(2) Those who contribute to the service lighting of Electricity Building through motor power taken from circuits in the Electricity Building.

Contributors to either class will be required to enter into a formal contract with the director-general, to be approved by the director of works, for furnishing and operating machinery offered in accordance with the following general terms :

No steam power being available in the Electricity Building, all generators provided by contributors of class (1) must be installed in Machinery Hall. Generators provided by American companies will be located in the regular service plant in Machinery Hall. Generators provided by foreign companies will be located in the spaces severally allotted to these countries in Machinery Hall.

Power circuits will be led from the generators of each contributor of class (1) through existing subways from Machinery Hall to the Electricity Building. The several exhibitors offering generators for this service are expected to furnish and install at their own expense the several power circuits before mentioned, subject to the supervision of the chief of department of electricity.

The aisles of the Electricity Building will be illuminated by arc lights, which will be considered the service lighting for the building. Arc lights in addition to these, as well as all incandescent lights, and power for keeping exhibits in motion, will be considered as special service rendered to individual exhibitors.

Power of operating generators needed for the service lighting will be furnished free of cost to the exhibitors installing this light. In consideration of such contribution to the service lighting of Electricity Building, exhibitors participating in this service will be granted such amount of extra power and light for the operation of their own exhibits as may be mutually agreed upon between them and the director general.

Arc and incandescent lights may be taken direct from the several power circuits leading from Machinery Hall, or they may be furnished from generators driven by motors taking current from the power circuits before mentioned, motors and generators in this latter case being located in the Electricity Building. Arc lights for all-night service are an exception to this rule, and will be supplied from the regular service plant already contracted for by the World's Columbian Exposition.

Contributors of class (2) who use current from the power circuits will be expected to provide the necessary motors, generators, and shaft free of cost to the World's Columbian Exposition. Exhibitors contributing to the arc lighting necessary in the service of the building will be expected to wire, hang and maintain such lamps as may be assigned to them free of cost to the World's Columbian Exposition. Such arc lamps, incandescent lights and motors as may be installed within the contributing exhibitor's space will be wired and hung by said exhibitor at his own expense.

In order to provide for lighting and power service to those exhibitors who do not contribute to the service of Electricity Building, it is proposed to assign to each exhibitor contributing to said service a specified portion of the Electricity Building in which to furnish special lighting and power. All works of wiring, hanging and maintenance of lamps, etc., done for other exhibitors in such space will be paid by the World's Columbian Exposition at the following rates :

(1) For each incandescent lamp, including the first lamp and socket with installation on a plain cord or pendant, $3.50 per 16 candle power lamp.

(a) Special fancy wiring will be furnished at an extra cost to be paid by consumer under special agreement with the director general, approved by the director of works.

(b) Fixtures and shades will be furnished and maintained by consumer.

(c) Lamps of other capacities, fancy or colored lamps, will be furnished in accordance with special agreement with the director general, approved by the director of works. Lamp renewals must be furnished free of charge by contributor. Breakages must be purchased by the consumer from the exhibitor supplying his exhibit, at the usual market price.

(2) For each arc lamp, including ceiling block, suspension rod and lamp complete, $35. Lamps must be furnished with opal globes. All care and attendance to lamps and circuits must be furnished without extra charge by the contributor maintaining the circuit.

(3) All wiring necessary for the installation of motors within the space assigned to each contributor shall be done by said contributor at the expense of exhibitor desiring said power, at the following rates:

One-half horse power and less, $8.

One to five horse power, per horse power, $5.

More than five-horse power and not exceeding ten horse power, per horse power, $10.

More than 10 horse power, per horse power, $8.

Fractions of a horse power will not be considered except for motors of less than 1 horse power. In all cases the rating of the motor will be the standard rating of the manufacturer.

Service connections, as well as all lamps and sockets, installed at contributor's expense, shall be maintained and owned by said contributor. All alterations of original installation shall be made by said contributor after written agreement between the exhibitor desiring change and the director-general, approved by the director of works.

All installation and operation shall be subject to the inspection and approval of the chief of the department of electricity. Installation must conform to the national code of the Board of Underwriters, subject to inspection and approval of the director-general.

Service will be provided only from May 1 to November 1, 1893, and during exposition hours, except by special authority from the director-general and director of works.

The service rendered will be entirely at the risk of the consumer. The World's Columbian Exposition will not be responsible for stoppages from any reasonable cause.

Rules Governing the Supply of Lighting and Power to Exhibitors in the Department of Electricity.—Electric power only will be supplied in the electrical building.

The aisles of the building will be illuminated with arc lamps without cost to exhibitors; additional lighting to be paid for by exhibitors at the following rates:

Arc lamps, service May 1 to Oct. 31, 1893, during exposition hours, $65 per lamp of 2,000 nominal candle power. Lamps suspended from ceiling, with opal globes and globe nets, special fixtures or globes, or special ornamental lamps, will be subject to an extra charge to be fixed by the director-general and the director of works.

Incandescent lamps, service May 1 to Oct. 31, inclusive, 1893, during the hours of the exposition, $8 per 16 candle power lamp, including installation of first lamp and socket and lamp renewals. Breakages must be purchased by exhibitor of the contractor lighting his space, at the usual commercial rate. Lamps will be hung on plain cord or pendant. Special or fancy wiring will be furnished at an extra charge to be fixed by the director general and the director of works. Fixtures and shades will be furnished and maintained by consumer. Special colored or fancy lamps, or lamps of other than 16-candle power, will be subject to special agreement with the director-general and approved by the director of works. Installations of 300 lamps or more will be subject to special discount to be fixed by the director general.

Motors.—Exhibitors requiring motive power will furnish necessary motors, rheostats, main line switches, insulating base, etc., complete, together with all belts, countershafting and other means of connecting motors to operating machinery. Motors should be suitable for operation on the class of circuit furnished in exhibitor's location.

The rheostats must be constructed wholly of non-combustible material. The main line switch shall be of the knife blade type, of ample carrying capacity, and suitable for breaking current at the potential used. Motors shall be erected in position at the expense of the exhibitor by the contractor furnishing power in the location of his exhibit, service connections to motors being installed, maintained and owned by the said contractor.

Charges for service connections with the main line will be as follows:

For ½ horse power and less, $8.

For 1 horse power to 5 horse power, per horse power, $12.

For more than 5 horse power and not exceeding 10 horse power, per horse power, $10.

For more than 10 horse power, per horse power, $8.

Fractions of a horse power will not be considered, except for motors of less than 1 horse power.

Ratings of motors will be the standard rating of the manufacturer.

Charges for service will be based on the maximum electrical horse power delivered to the motor, irrespective of the class of work to be operated by the motor, at the following rates:

For ¼ horse power and less, $15.

For more than ¼ horse power, and not exceeding ½ horse power, $30.

For more than ½ horse power, and not exceeding 1 horse power, $50.

For more than 1 horse power, and not exceeding 2 horse power, per horse power, $45.

For more than 2 horse power, and not exceeding 3 horse power, per horse power, $42.50.

For more than 3 horse power, per horse power, $40.

A limited amount of power may be furnished to exhibitors free of charge to simply turn over an otherwise inoperative exhibit.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THERE was, after all, every ground for the assertion that Mr. Villard, President of the St. Paul (Minn.) Gas Light Company, had sold his holdings in that Company. The purchasers were local capitalists, and while we are not positive such is the case, there is good ground for the belief that the present owners of the Villard interest are largely interested in the local electric lighting companies.

MR. FREDERICK BREDEL, seemingly fearing that his credit at his butchers was in danger of impairment, shouldered his rifle and hied him away to Northern Wisconsin. The net result of his journey was plenty of fresh meat in the Bredel household; three lusty buck deer having fallen before his "trusty gun."

THE Pana (Ills.) Gas and Coke Company has been incorporated by Messrs. A. B. Gorman, W. H. Newcombe and others. It is capitalized in $50,000. This place, which is in Christian county, Ills., at the intersection of the Illinois Central, the Indianapolis & St. Louis, and the Springfield branch of the old Ohio & Mississippi Railroads, is about midway of Springfield, Ills., and Decatur, Ind. It is a thriving place, and has a population of about 5,500. A gas works ought to prove a profitable venture there.

JUDGE FINNEY, of the Pomona (Cal.) Gas Company, says that the Company will install an electric lighting plant.

THE cases of Albert Lewis vs. the Boston Gas Light Company, and Daniel Goodnow vs. the same, which were recently tried in the Superior Court of Suffolk county, Mass., were two actions of tort, tried together, to recover damages for injuries to plaintiffs' estate on Commercial street by reason of an explosion of gas, resulting from a leaking gas main on Concord avenue. A verdict of $573.05 in the first case and of $1,182.25 in the second case was returned.

THERE is a novel sort of patented process gas man in Detroit. His name is Ellsworth, and he has been dabbling in gas patents for gas processes for several years. He claims that he can manufacture gas under his system for something like 30 cents per 1,000 cubic feet, and there is where the novelty comes in—a process man who puts the cost of making gas at something like a reasonable figure. As far as we can judge however, from our knowledge at hand of his process and methods, we do not think there is much merit in the system.

THE following clipping from the Bridgeport (Conn.) *Standard* was forwarded by "Observer": *To the Honorable General Assembly of the State of Connecticut, to be convened at Hartford, in and for said State, on the Wednesday following the first Monday of January, A. D.*, 1893.—The undersigned, "The Citizens Gas Company," of Bridgeport, Conn., a duly incorporated Company under the laws of this State, hereby humbly petitions and requests your honorable body to amend the charter of said Company, by increasing the capital stock thereof to such an amount as, upon examination and inquiry shall seem to your honorable body to be necessary and proper to enable said Company to carry on its contemplated business. Also, to further amend its charter by granting to your petitioner power and authority to issue its bonds to enable it to raise the necessary funds with which to prosecute

its business and work successfully; the same to be issued to such an amount and in such sums and under such restrictions, conditions and regulations as to your honorable body shall seem necessary, judicious and proper. And as in duty bound your petitioner will ever pray. Dated at Bridgeport, Conn., December 12, 1892.—THE CITIZENS GAS CO., by D. F. HOLLISTER, Secy.

FOLLOWING the above, the appended notice by the State appears: *The Citizens Gas Company, of Bridgeport, vs. Whom it May Concern. Order of Notice.*

STATE OF CONNECTICUT, } ss. BRIDGEPORT,
FAIRFIELD COUNTY, } Dec. 12, A.D., 1892.

Upon the petition of the said Citizens Gas Company, praying for reasons therein set forth for certain amendments and enlargements of its charter, as is in said foregoing petition specified, returnable to the General Assembly of the State of Connecticut on the Wednesday following the first Monday of January, 1893. It appearing to and being found by the subscribing authority that said petition is of an adversary nature, and that the adverse party consists of more than 20 persons.

Therefore, Ordered that notice of the pendency of said complaint be given, by publishing this order in the Bridgeport *Standard*, a newspaper printed in Bridgeport, two days successively, commencing on or before the 13th day of December, A.D., 1892.—F. B. HALL, Judge of the Superior Court.

THE State Board of Gas and Electric Light Commissioners and the Boston Gas Company came to an important understanding on the 13th inst., says the Boston *Herald*, whereby, on and after January 1, the price of gas for cooking, heating and power purposes will be fixed at $1 per 1,000 cubic feet, a reduction of 30 cents per 1,000. It was also agreed that on and after the same date gas for lighting purposes, when the consumer used $1,000 worth and upward per annum, be fixed at $1.20 per 1,000. The candle power of the gas is also to be increased to 25 candles. This agreement is the outcome of petitioners, largely hotels and business houses, burning great quantities of gas, who asked for the reduction about six months ago. The Commissioners heard the petitioners, and voted on December 13th that the case be disposed of in accordance with the request of the parties whenever the Directors of the Company shall pass votes necessary to fully adopt such agreement on its part. The following action of the Company is in accordance with the request.

BOSTON GAS LIGHT COMPANY,
BOSTON, MASS., Dec. 12, 1892.

At a meeting of the Board of Directors of the Boston Gas Light Company, held this day, it was

Voted, That on and after January 1, 1893, the price of gas used for cooking, heating and power purposes be fixed at $1 per 1,000 cubic feet, measured through an independent meter supplied by the Company free of rent.

Voted, That on and after January 1, 1893, the price of gas to all those who burn, for lighting purposes, $1,000 worth and upward per annum, be fixed at $1.20 per 1,000 feet.

Voted, That on and after January 1, 1893, or as soon thereafter as the new water gas works, in process of erection at the North End station, are finished, the candle power of the gas supplied by this Company be 25 candles.

Voted, That a certified copy of the preceding votes be filed with the Board of Gas and Electric Light Commissioners.

THE Indianapolis *Journal* is responsible for the following: "What made you name your farm 'Meter?' queried the reporter. 'Because it lies so beautifully,' answered the retired gas magnate, with a low, sibilant chuckle."

THE water gas plant of the Denver (Col.) Consolidated Gas Company has been fired up. The contractors did their work very well.

LAST week we mentioned that Manager Tracy, of the Poughkeepsie (N. Y.) Gas Company, was about to pay his respects to an itinerant gas meter inspector, who proposed to test the consumers' meters for a stated small fee. Mr. Tracy attended to the "inspector's" case last week, for shortly after he made his appearance Tracy escorted him to the Hudson River Railroad Company's station, bought a ticket to New York for him, and bid him "adieu."

MESSRS. W. E. MCCULLY, Thos. E. Wardell and Harry Rule, of Macon City, Mo., have been granted a franchise by the City Council for the construction and operation of a gas works at Mexico, Mo. It is stipulated that $2 per 1,000 shall be the maximum charge. This place is the capital of Audrain county, Mo., and is on a branch of the Salt River, at a point 108 miles northwest of St. Louis. It can be reached by the St. Louis, Kansas City and Northern, and the South Branch of the Louisiana and Missouri River Railroad. It is a growing business center. Population in 1880, 2,602; in 1890, 4,987.

THE next City Council of Springfield, Mass., will probably (so says a local authority) have to consider the expediency of municipal ownership or control of the plants for the distribution of gas throughout the city. The issue was raised in the Republican convention for the nomination of municipal officers at the City Hall, on Nov. 22, when the following resolution was unanimously adopted:

"*Resolved*, That such of the nominees of this convention as may be elected to the city government are requested to consider the expediency of securing for the municipality the ownership of the plant for the distribution of gas and electricity throughout the city; or, if such ownership is not desirable, then to adopt some plan for the regulation of the prices charged to all consumers by the existing corporations."

Mayor-elect Kendrick, when appealed to for his views on the subject, confessed to having but a slight knowledge of the subject, although he had conversed once or twice on the subject with Charles H. Barrows, who introduced the resolution in the Republican city convention. Mr. Kendrick said that so far he entertained a favorable view of the subject, and saw wherein such a move might work good; but he believed that the experience of some of the cities where the lighting plants were under municipal control was that they could be better managed with advantage to the consumer by private corporations than by a city. It is certainly, he added, the duty of the citizens to get their light at as low a figure as possible, and it is quite possible that such a move might bring about a reduction in price. Asked if he believed that such an order—viz., to put the system under municipal control—would be introduced in the upper Board early in the forthcoming administration, he said that the first proposition looking toward this end would have to come from the citizens in the form of a petition, and on the receipt of such the Board would of course give the matter its earliest consideration. Olin H. Smith, Alderman-elect from the First Ward, said he had given the matter only such thought as the average active business man would be likely to, without having at all thoroughly investigated it. He expressed himself as being inclined to favor municipal control of lighting plants, but was more heartily in accord with plans for the regulation of prices. In other words, he believed it was easier to bring existing corporations to a reasonable price schedule through the State Commissioners than to start new plants, or attempt the details of management in the old. Ald. C. C. Margerum said: "I have not given any particular thought to the matter, but it seems to me that it would be a good idea if it can be carried out. Of course, there would be a great deal of work and trouble in putting the suggestion into practice, and it would undoubtedly take considerable time, but I believe it is entirely feasible. It would be a good thing for the city. Our present contract for light is at a lower rate than we have heretofore obtained, and I understand the Company will decline to renew it at the same price. The present contract would have to be kept until it expires, by its terms, whatever is done about city control of the service." Ald. Benjamin C. Harvey said: "Except in a general way, I have not studied the matter very carefully, and certainly not enough to advance any idea or plan by which the change could be brought about. There is more or less talk of the city's purchasing Hampden Park before it slips through our fingers, but I don't know whether that would have any bearing on the light question or not. There are a good many things to be considered, but if the city could acquire and own its own lighting system, it would be an excellent thing, in my opinion." He did not see how any restriction could be put on the price now charged, as the city had no control over the Companies. "If it were a new franchise that was being granted," said Mr. Harvey, "it might be possible to place such regulation upon them by making it a part of the franchise, but I do not see how it can be accomplished in the present case." He also spoke of the low price under the present contract, and of the fact that it would have to be continued until it ran out. Ald. Leonard B. Richardson said: "I think it would be a good thing, and I am for whatever is best for the city at the lowest price. I have not studied the matter attentively, but it appears to me to be practical and feasible, and I do not know why it could not be put into practice. The labor and care involved in a matter of that kind should not, however, be overlooked. But if, after careful consideration, it seemed expedient and for the benefit of the city, I shall be heartily in favor of it. It may take a good while to bring it around, but I think it can be done." Ald.-Elect George Nye said he was not yet sufficiently posted to talk much about the lighting question, or express a settled opinion. He favored the opinion of controlling prices rather than

securing ownership, but was at the same time opposed to much tinkering with private enterprises. Ald.-Elect H. H. Bowman, when asked for his views, thought that as much could be said on both sides of the issue, he begged to be excused for the present from saying anything. Ald.-Elect Dwight O. Gilmore said that as it was a matter to which he had given no consideration, he would not care to make a statement. Continuing, Mr. Gilmore said: "If the matter comes up before the Board, I think it should be thoroughly investigated before action is taken. Other cities should be compared, and what is found to be the best system should be adopted." Ald.-Elect Nathan D. Bell said he had not examined the matter carefully enough to give an opinion as to its feasibility or otherwise. It was a matter that required careful looking into before anything could be said for or against it, and he preferred not to express an opinion before carefully looking on both sides of the question. If the matter should come before the City Council there was no doubt that it would receive careful consideration.

THE itinerant meter inspector, we understand, did not do as he was directed nor as he agreed to when Mr. Tracy, of Poughkeepsie, shipped him from that city via the New York Central. He journeyed by the Central to the next town that contained a gas works, and, not meeting much encouragement there (we think the place was Fishkill), he came on to Peekskill. If Mr. Sutton knows his business, that inspector won't stay in Peekskill long, unless his lodging house is the lockup.

THE Highway Commissioners of the town have entered into a contract with the Flatbush (L. I.) Gas Light Company, under which the latter will light the public lamps for the ensuing year, at the rate of $25 per post.

THE Boston *Transcript* says: "Philadelphia's municipal gas works furnish cheaper gas to the inhabitants than can be obtained in any other center of population in the country," and in so saying the *Transcript* shows its supreme ignorance. We do not know whether the *Transcript* man considers Boston a "center of population," but we do know that the Boston Gas Light Company sells gas to the ordinary consumer at $1.30 per 1,000, whereas the Philadelphia consumer is charged $1.50 per 1,000; in New York—which is, according to our view, a "center of population"—the rate is $1.25; likewise, in Brooklyn; in Cleveland, Ohio, the rate is 74.80 cents per 1,000; in Cincinnati, Ohio, the rate is about $1; in Chicago, it is something less than $1.25; in Milwaukee, Wis., it is $1—in fact, the highest gas rate in our largest cities is very much less than the Philadelphia tariff; and a like remark applies to many of the towns that have only one-quarter the population that can be counted in a single Philadelphia Ward.

AT the stockholders' meeting of the Columbia (Pa.) Gas Company the following Directors were elected: Jas. A. Meyers, H. M. North, C. E. Graybill, William B. Given, H. F. Bruner, M. S. Shuman and Joseph Black. The Board will meet for organization purposes on January 14th.

THE following matter relative to the discussion or controversy between Mr. J. Edward Addicks and the Street and Sewer Department of Wilmington, Del., explains itself: "During a special meeting of the Street and Sewer Department, the Directors discussed the proposition recently made by J. Edward Addicks, of the Oxy-Hydrogen Company, in regard to laying gas pipes in the streets. The Directors were of opinion that no better reasons exist now for giving permission to the Oxy-Hydrogen Company to lay its pipes in the streets of Wilmington than there did at the time the injunction was asked for and issued. The Directors were also of the opinion that in view of the threatened visitation of cholera next year, it would be injudicious and also detrimental to the health of the city to allow trenches to be opened all over the city for the purpose of laying gas pipes. It was decided to instruct the city solicitor, Mr. Charles M. Curtis, to prepare an answer to the Oxy-Hydrogen Company, the tenor of the answer to be in keeping with the line of reasoning noted above."

A FIRE is reported to have slightly damaged the fuel gas plant operated in connection with the works of the John Russell Cutlery Company, of Turners Falls, Mass.

ANOTHER fire in a gas works happened about a fortnight ago, when the plant of the St. Albans (Vt.) Company was damaged in the sum of $1,000. An ignition of naphtha was the cause.

THE Springfield (O.) and the Dayton (O.) natural Gas Companies have been consolidated, and Mr. E. R. Leland, of New York City, has been chosen President of the combination.

THE name of the proposed opposition Company for Montreal is that of the City and Suburban Gas Company. It seems to us that it is pretty well handicapped at the start, or else there is not anything in a name.

ONE of the city fathers of Chattanooga, Tenn., is very much disturbed over the gas supply of the city, and so is engaged in "deep thought" respecting an ordinance for the regulation of the business. A few days ago a reporter on one of the local newspapers approached the father (whose name is Whiteside) in the attempt to obtain from him some inkling of the provisions of the ordinance; and this is what he said: "I am bent on securing a remedy for what appears to be an outrageous state of affairs. The meters of the Gas Company are faulty, and the bills of that institution are in the same category. People are taxed unjustly by the Company and are made to pay for what they do not get. The gas furnished is of poor quality; it is not up to the candle power that it should be. I propose to have the candle power of the lights tested, and that the meters shall be inspected. I also shall endeavor to have the Council regulate the price at which gas shall be sold in the city."

FATHER WHITESIDE, it will be seen from the above, thinks pretty well of himself; but looking it over calmly, it does seem a pity that corporations are soulless—otherwise Whiteside might have a chance to defend a suit for libel.

THE Edison Electric Light and Power Company and the Electric Improvement Company, of San Francisco, Cal., have at last agreed to come together. On January 1st the former takes possession, and thereafter the consumers will pay the piper. During the competition, rates were cut quite as much as 55 per cent.

EX-ALDERMAN JOHN SHERMAN and others have petitioned the Council of Des Moines, Ia., for a franchise for an opposition gas company. The main points in the application are: A corporate life of 10 years; the right to charge 65 cents per 1,000 for fuel gas and $1 per 1,000 for illuminating gas; the city to be paid at the rate of 5 cents per 1,000 cubic feet of gas sold by the Company for every 1,000 sold in excess of 50,000,000 cubic feet per annum; and to furnish gas for street lamps at the rate of $1.25 each per month. It is further stipulated that the illuminating power of the gas shall not be less than 22 candles, and that its heating power "shall not be less than 75 per cent. of the heat units of natural gas."

Silencing Gas and Steam Engine Exhausts.

The London *Journal* "notes" that M. Simon has communicated to *L'Electricien* a suggestion for reducing the noise of gas engine exhausts. He points out that the noise is of two kinds. There is, first, a blow at every discharge; and, secondly, a distinctive note given out by the escape of the gases under pressure, which is always produced whether the exhaust is spasmodic or regular. As a matter of practice, the shock of the first can be mitigated by exhausting into chambers which play the same part as the air chambers of double acting pumps. Unfortunately this remedy is limited in application by the danger of filling large receivers with gases that may have escaped combustion in the cylinder, and thus compose an explosive mixture. Moreover, this method of regulation creates back pressure, and therefore, for two reasons it is of limited applicability. M. Simon says that what is wanted is a gradual and insensible diminution of the average velocity of the exhaust gases. The variations of pressure, and consequently of volume, would thus be rendered very small, and the violence of the blows would be diminished; while the exhaust gases, having a lower velocity, would no longer give a loud note.

A system of very acute-angled conical tubes has been tried by M. Simon himself and others, with the idea that the insensibly increasing cross section should produce a gradual diminution of velocity. Unfortunately, when the diameter approaches a certain value, the velocity of the gases is no longer equal over any given section, owing to the friction of the sides, which creates a series of vortices that make the tubes quiver, and so produces an effect the reverse of what is intended. M. Simon has substituted for these cones a single straight pipe, split for a distance of about 2 meters. The opening is very narrow at the bottom, and widens out until it attains a width equal to the diameter of the tube. The effect produced is remarkable when the right width for the cut has been hit upon; and this can only be done by the method of trial and error. It is no easy matter to split a tube in this way by means of ordinary tools, and alterations are a long and troublesome job. M. Simon has considerably simplified matters by giving the tube a long saw-cut lengthwise; the two halves being then opened out and kept apart by wedges and rings. From such an outlet the puff of exhaust gas spreads out like a fan, and the passage from the tube to the open air is very gradual. Such is the method, at once simple and cheap, which M. Simon has applied to his own satisfaction, and particularly to that of his neighbors, whose quiet was broken by his gas engine. The same device will effectually reduce the noise of steam escaping from a pipe.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

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AGENTS
NEW YORK.—AMERICAN NEWS CO., 39 and 41 Chambers Street.
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MONDAY, DECEMBER 26, 1892.

The Market for Gas Securities.

An uneven money market, the eccentricities of which were largely caused by the maneuvrings of the maurauding type of money controllers, caused a general break in the share market. Consolidated gas was a sufferer at the hands of the peggers, who managed to quote it down to less than 123. To day (Friday) the opening was made at 122½ to 122¾, which is a net loss of three-quarters of a point from the opening of last week. The Company is in remarkably good financial position just now, and while we imagine an effort will be made this winter to meddle with gas prices, we do not think anything much will come of it. Equitable gas went booming this week, and is quoted at 188 bid, and holders of it are talking of a stock dividend. Standard common is quoted at 35 to 40, and the preferred is strong at 88 to 91, ex-dividend. Mutual is steady, with no stock offering.

The Brooklyn situation is simply in a beautiful snarl, and any attempt on our part at defining the status would be valueless. In the meantime all Brooklyn gas shares are strong and higher, as will be seen from the quotations; and we also believe that every stock on the list, save possibly the Equity, is a sale at the reported figures. There can be no blinking the fact that the Equity Company must be an important factor in any attempt at consolidation in Brooklyn, and with every day that passes its importance as such factor increases. The Bay State pet securities of Mr. Addicks are drooping, not, however, from lack of moisture, but from natural causes. We might also remark that that other scheme of his—the Oxy-Hydrogen Company, of Delaware—is not in lusty shape; an "item" in this issue will explain that more fully. The bears had quite a merry time with Chicago gas last week. The opening to-day was made at 84¾ to 85; and at these figures the shares are cheap. Baltimore Consolidated shows no marked change over last report. At auction: 10 shares Standard Common, at 37; 30 shares Equitable Gas Light Company, of Utica, N. Y., at 70½.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
16 WALL ST., NEW YORK CITY.
DECEMBER 26.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	122½	122¾
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	188	192
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	142	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	35	40
Preferred	5,000,000	100	88	91x
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	138	140
Citizens	1,200,000	20	112	113
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co.	2,000,000	100	44	—
Bonds	1,000,000	—	70	—
Fulton Municipal	3,000,000	100	149	150
" Bonds	300,000		102	—
Peoples	1,000,000	10	—	107
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	—	135
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	160	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	150	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	88½	88¾
2d " " "	3,000,000	1000	77½	78
Bay State Gas Co.—				
Stock	5,000,000	50	56	57
Income Bonds	2,000,000	1000	77	78
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company	25,000,000	100	84⅞	85
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	90½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	105	—
2d "	2,500,000	1000	104	105
Consumers Gas Light Co., Jersey City	2,000,000	100	20	—
Bonds	600,000	1000	80	—
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	190	191
Central, S. F., Cal			90	—
Capital, Sacramento, Cal			55	—
Consolidated, Balt.	11,000,000	100	58¾	59
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	180	200
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	22½	23½
Preferred "	2,500,000	100	68	70
Bonds	9,034,400	1000	84⅞	85
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	40	—
" Bonds	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			40	45
Peoples, Jersey City		—	115	125
" " Bonds			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	99	100
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co.				
San Francisco, Cal	10,000,000	100	72¾	73
Washington, D. C	2,000,000	20	200	208
Wilmington, Del		50	88	90

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903-tf "C." care this Journal.

Position Wanted
As Manager or Superintendent of Gas Works,
By a practical man of 15 years' experience in all branches of the business. Now 35 years old, and a pusher. Good references given. Address
910-8 "D.," care this Journal.

DIVIDEND NOTICE.

STANDARD GAS LIGHT CO. OF THE CITY OF NEW YORK,
71 BROADWAY, NEW YORK, Dec. 2, 1892.

The Board of Directors have this day declared a dividend of one (1) per cent. on the Preferred Stock of this Company, payable on Jan. 3d, 1893, to stockholders of record at 3 o'clock P M., Dec. 21st, 1892.

Transfer books will be closed from 3 o'clock P.M., Dec. 21st, 1892, to 10 o'clock A.M., Jan. 4th, 1893.

FERDINAND McKEIGE,
914-4 Secretary.

EXECUTOR'S SALE,
TO CLOSE THE ESTATE OF WM. VOORHIS, DECEASED.

The undersigned, Executors, etc., of William Voorhis, deceased, will sell at Public Auction, at the Hotel St. George, kept by George Bardin, on Burd Street, in the village of Nyack, on Tuesday, Dec. 27, 1892, at 10 o'clock in the forenoon, all the plant and properties lately of the
NYACK AND WARREN GAS LIGHT COMPANY,
consisting of a lot of land and premises situate upon the easterly side of Gedney Street, in the village of Nyack, about 84 ft. in width front and rear, and 130 ft. in depth, with the buildings thereon; together with all the boilers, engines, pumps, gas benches, holders, street mains, meters, connections, coal, oil, tools, implements, etc., etc., etc.
Terms made known on day of sale.
Dated Nyack, N.Y., Dec. 10, 1892. W. L. VOORHIS, A. M. VOORHIS, D. H. CLOSE, } Executors.
915-2

Proposals for Coal Tar.

THE LEBANON GAS COMPANY will receive bids for their **Tar Product of 1893**—making gas under the old process, from best g s coal. Two hundred and fifty (250) bbls. will be about the amount of the pr duct. Bids will be opened Jan. 2, 1893. JOHN M. MISH, Treas.

LEBANON, PA., Dec. 1, 1892.

PROPOSALS

FOR AN

Electric Light Franchise.

DU QUOIN, ILL., Dec. 3, 1892.

Proposals for an Electric Light Franchise will be received by the undersigned at his office, up to 12 o'clock, noon, January the 6th, 1893, in accordance with Sec. No. 10 of Ordinance No. 96 of the City of Du Quoin, Ills., which is as follows:

"And it is further agreed with the said John R. Truesdale, his successors or assigns, that, if the said city or its inhabitants shall desire electricity for light or other purposes, the said John R. Truesdale, his successors or assigns, shall have the exclusive right to establish and operate a plant for such purpose or purposes, provided, always, he or they will furnish such electricity upon as favorable terms or conditions as may be offered by other responsible competing persons or companies. And in case he or they will not furnish it, then the city may grant the exclusive right to do so to other persons, companies or corporation"

Each proposal shall stipulate the maximum price to be charged private consumers, also the city, for both arc and incandescent lights; and no proposal will be considered unless accompanied with a $5,000.00 bond, or certified check, to guarantee the fulfillment of the franchise to be granted.

The city reserves the right to reject any and all proposals. The term for which the franchise will run will be until Sept. 17th, 1900.

(Signed) F. V. NETTLETON,
City Clerk.

914-5

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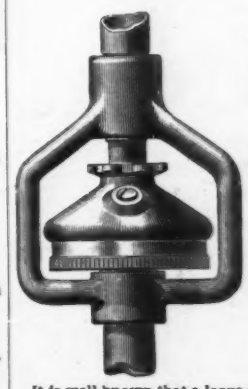

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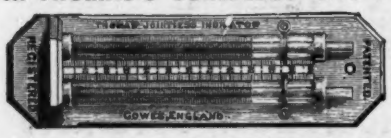

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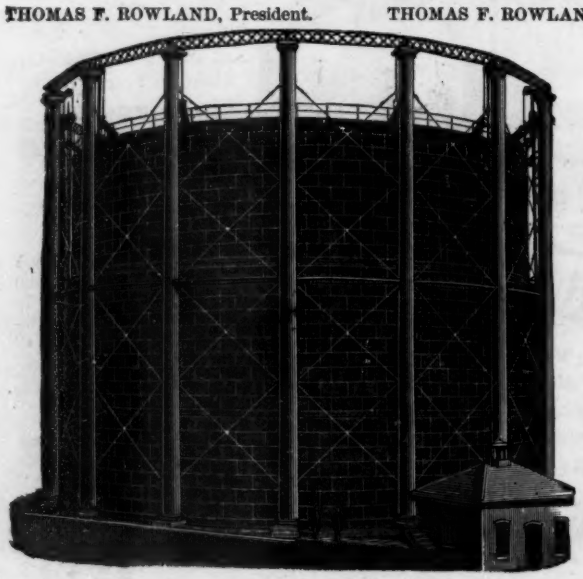

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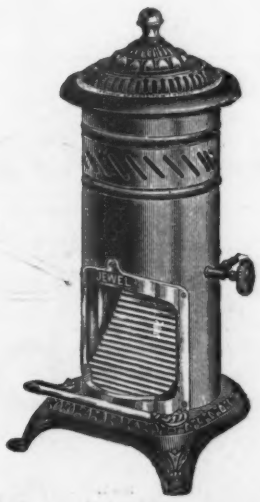

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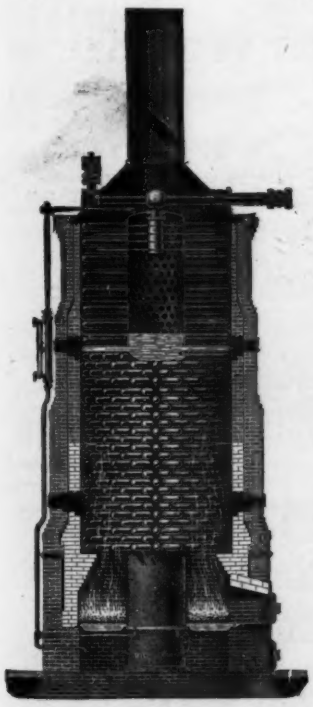

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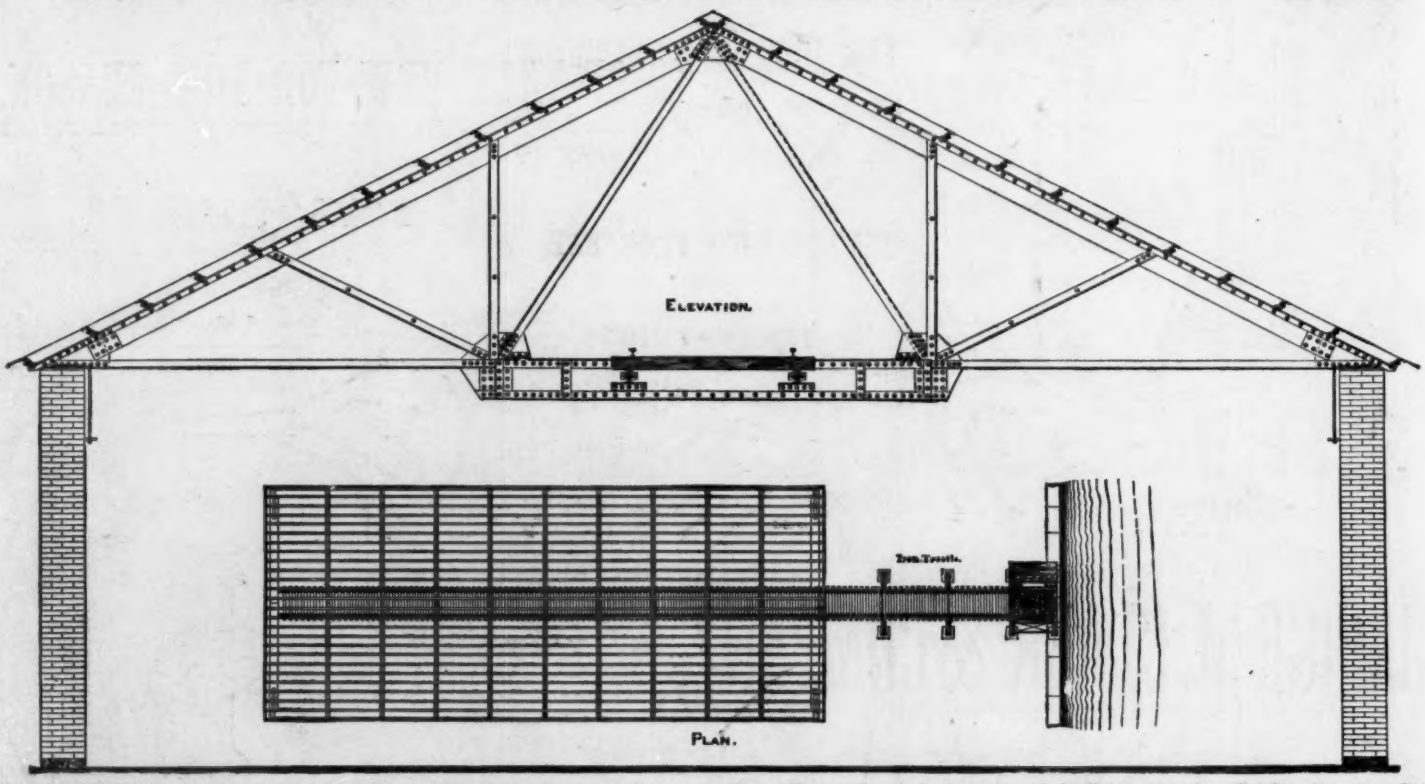

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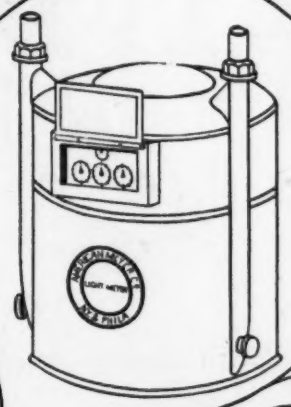

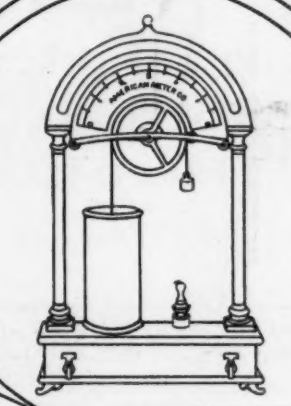

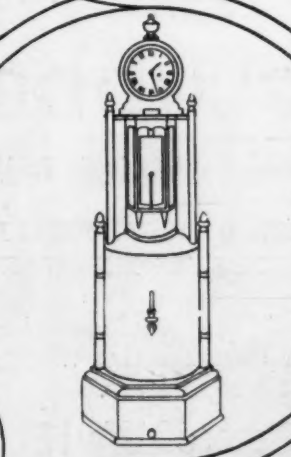

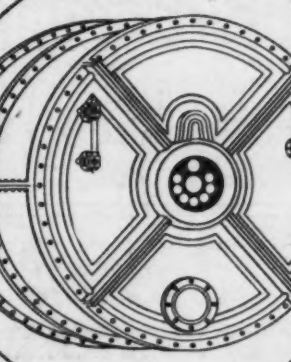

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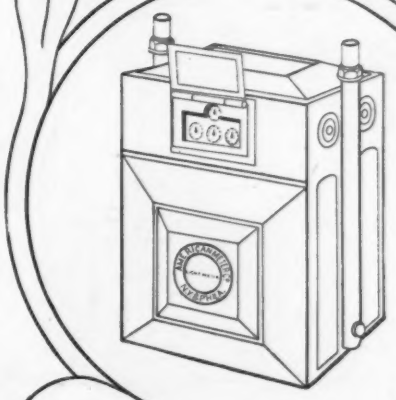
PUBLIC LIGHTING TABLE.

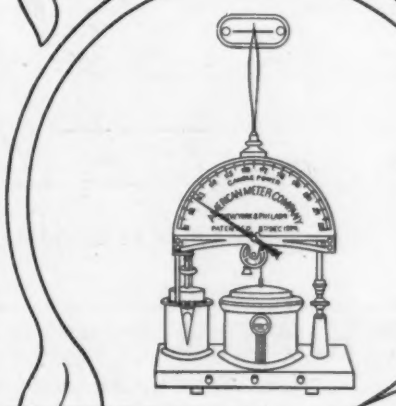
JANUARY, 1893.

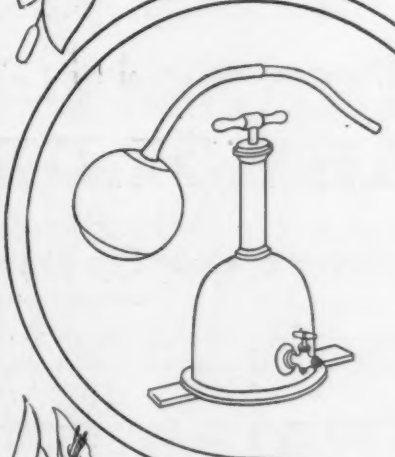
Day of Week.	Table No. 1. Following the Moon.			Table No. 2. New York City. All Night Lighting.	
	Date.	Light.	Extinguish.	Light.	Extinguish.
				P. M.	A. M.
Sun.	1	No L.	No L.	4.30	6.30
Mon.	2	No L. FM	No L.	4.30	6.30
Tue.	3	No L.	No L.	4.30	6.30
Wed.	4	5.20 P.M.	8.10 P.M.	4.30	6.30
Thu.	5	5.20	9.20	4.30	6.30
Fri.	6	5.20	10.30	4.30	6.30
Sat.	7	5.20	11.30	4.30	6.30
Sun.	8	5.20	12.30 A.M.	4.40	6.30
Mon.	9	5.20 LQ	1.40	4.40	6.30
Tue.	10	5.20	2.40	4.40	6.30
Wed.	11	5.20	3.40	4.40	6.30
Thu.	12	5.30	4.40	4.40	6.30
Fri.	13	5.30	5.40	4.40	6.30
Sat.	14	5.30	6.20	4.40	6.30
Sun.	15	5.30	6.20	4.50	6.25
Mon.	16	5.30	6.20	4.50	6.25
Tue.	17	5.30 NM	6.20	4.50	6.25
Wed.	18	5.30	6.20	4.50	6.25
Thu.	19	5.30	6.20	4.50	6.25
Fri.	20	5.30	6.20	4.50	6.25
Sat.	21	5.30	6.20	4.50	6.25
Sun.	22	9.20	6.20	5.00	6.25
Mon.	23	10.30	6.20	5.00	6.25
Tue.	24	11.40	6.20	5.00	6.25
Wed.	25	12.50 A.M. FQ	6.20	5.00	6.25
Thu.	26	2.10	6.10	5.00	6.25
Fri.	27	3.20	6.10	5.00	6.25
Sat.	28	4.30	6.10	5.00	6.25
Sun.	29	5.30	6.10	5.05	6.15
Mon.	30	No L.	No L.	5.05	6.15
Tue.	31	No L. FM	No L.	5.05	6.15

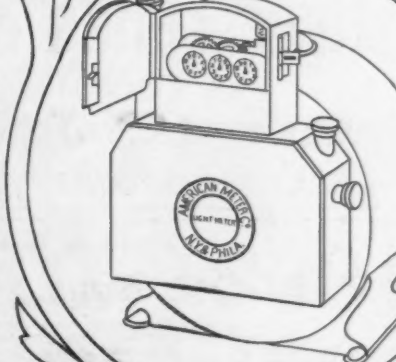
TOTAL HOURS LIGHTING DURING 1893.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January...	217.30	January...	423.20
February..	200.30	February..	355.25
March	177.50	March	355.35
April.....	160.30	April.....	298.50
May.....	149.00	May.....	264.50
June.....	140.30	June.....	234.25
July.....	143.40	July.....	243.45
August....	154.50	August....	280.25
September.	171.50	September.	321.15
October....	202.20	October....	374.30
November.	221.30	November.	401.40
December.	248.50	December.	433.45
Total..	2188.50	Total..	3987.45









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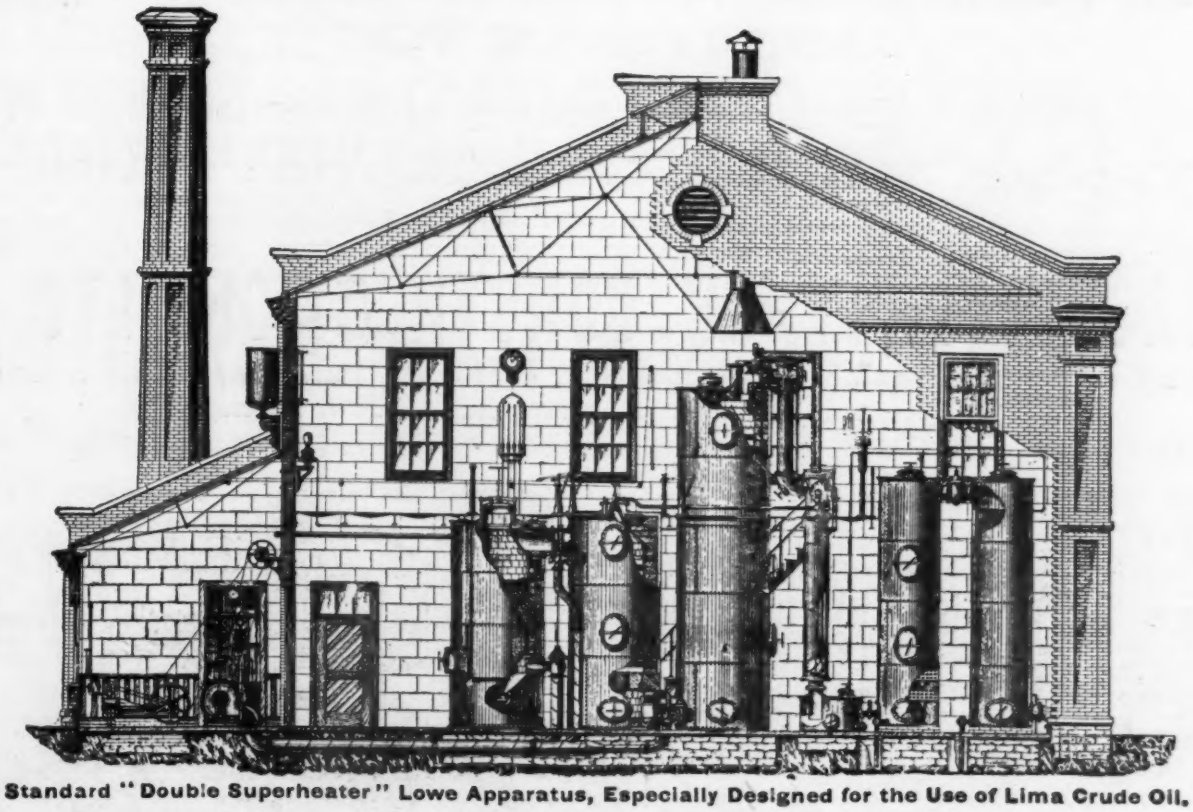

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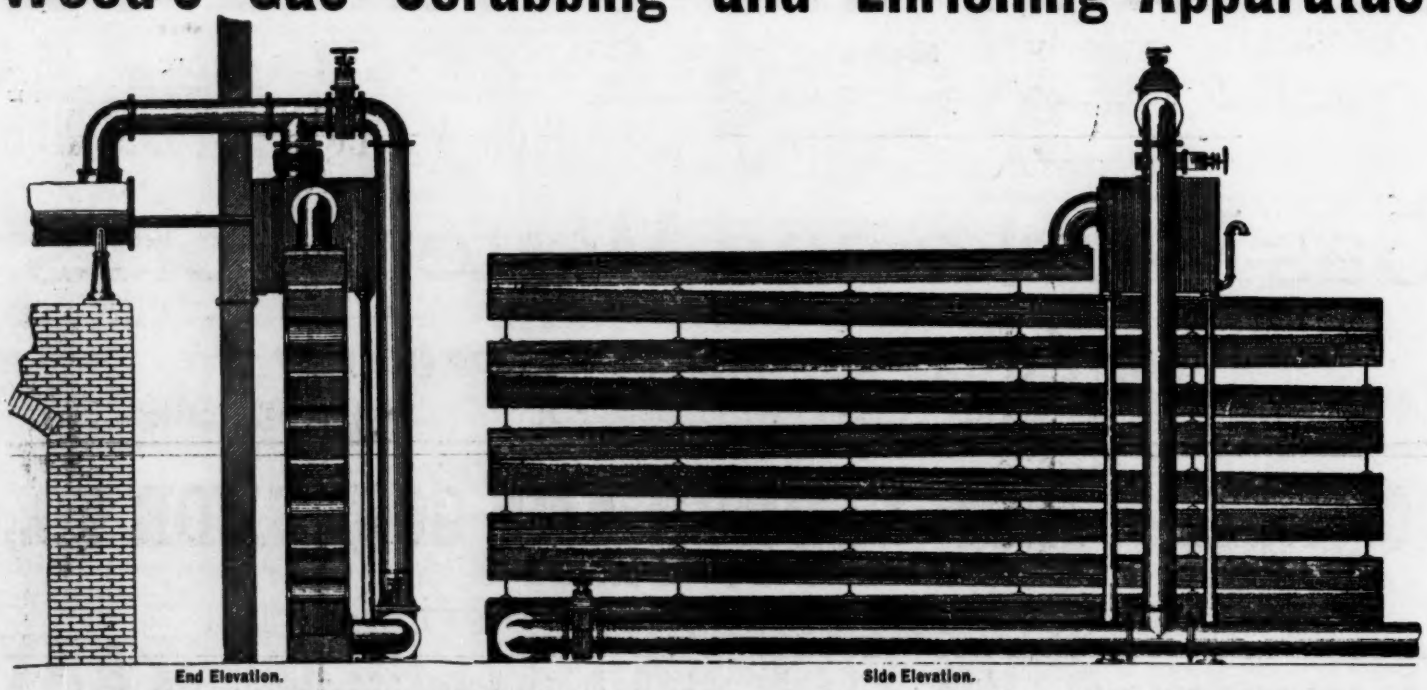

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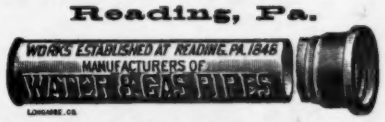

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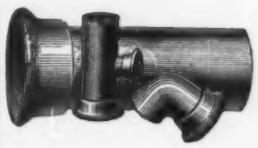

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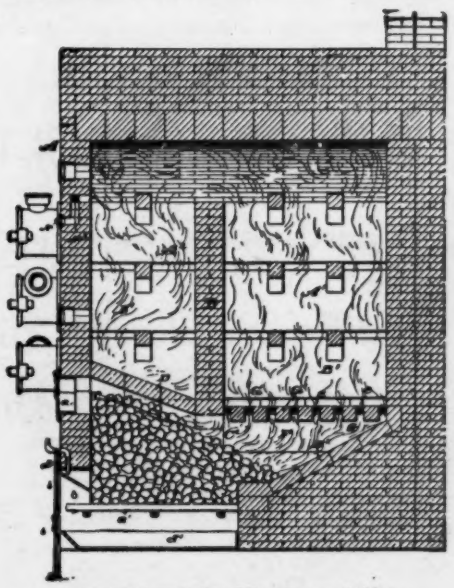

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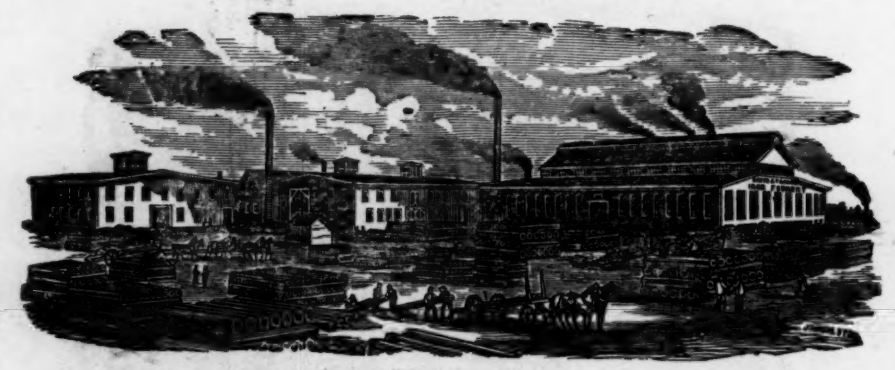

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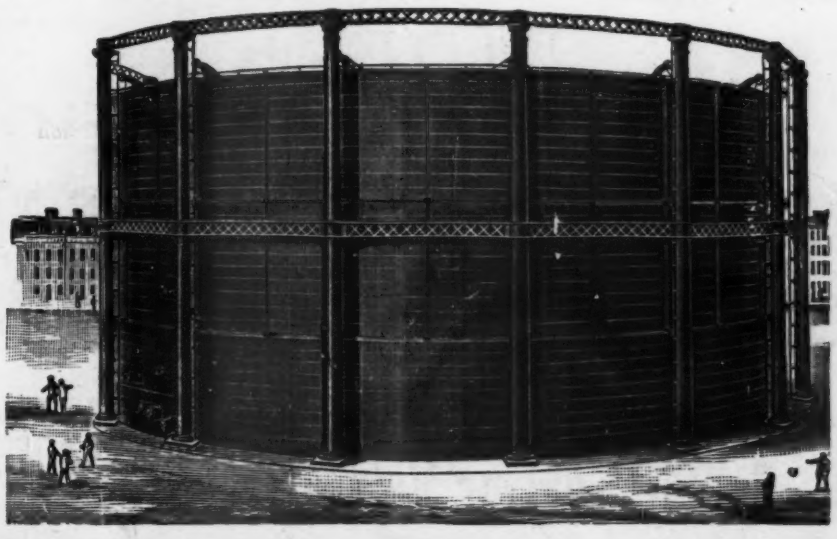

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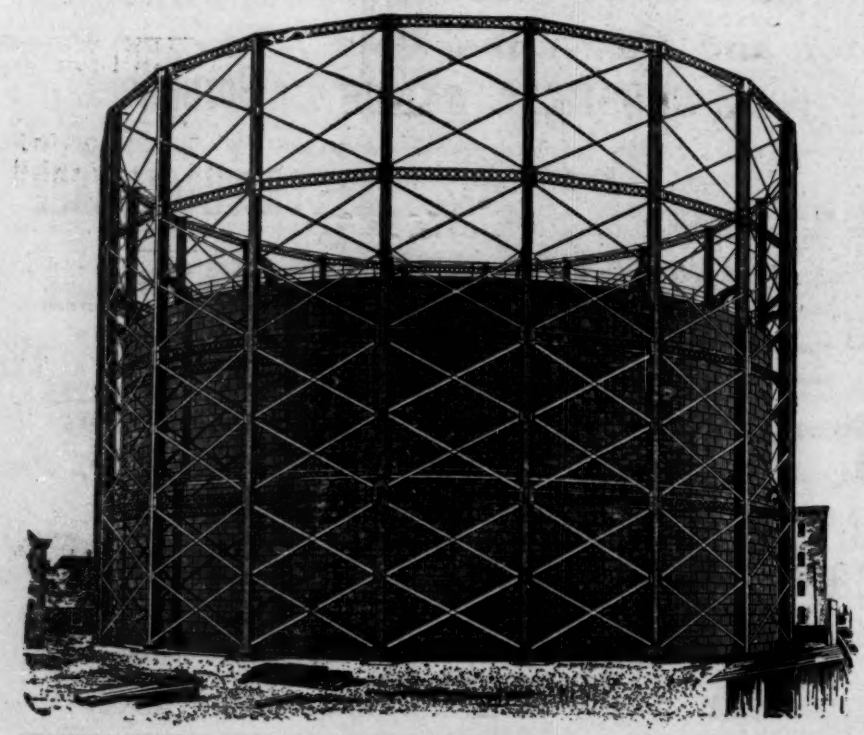

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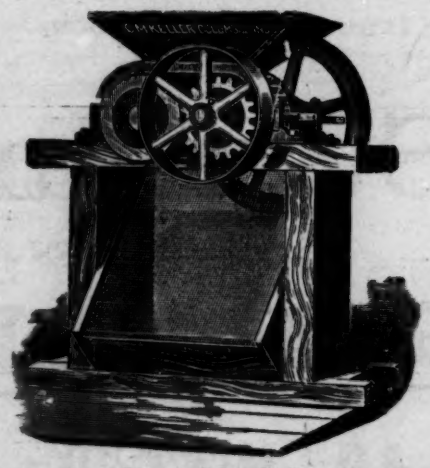

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Mr. Thomas Fletcher, well known in the Gas Industry, gives his opinion on this question as follows:

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